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ABSTRACT

This teacher's guide presents teaching suggestions and presentation materials about the challenges faced by China and India as they work to sustain their population and ways of life without exhausting the environmental resources each has. The materials may be used as a unit on either nation or integrated into existing units of study. Student handouts include: (1) "What's It Like in India?"; (2) "What's It Like in China?"; (3) "India's Population Future"; (4) "China's Population Future"; (5) "Urban Life in India"; (6) "Urban Life in China"; (7) "Food Production and Agriculture in India"; (8) "Food Production and Agriculture in China"; (9) "Maintaining Forests and Biodiversity in India"; (10) "Maintaining Forests and Biodiversity in China"; (11) "India's Energy Prospects"; (12) "China's Energy Prospects"; (13) "Six Megacities"; (14) "Voices of India"; and (15) "Voices of China." Transparency masters are titled: (1) "Population, China and India, 1950-2050"; (2) "Population Density"; (3) "Per Capita Cereal Production, 1961-90"; (4) "Degree of Human Disturbance, Vegetated Land Area, 1993"; (5) "Total Energy Use, 1970-91"; and (6) "Energy Consumption Per Capita, 1991." (Contains a 36-item bibliography.) (EH)

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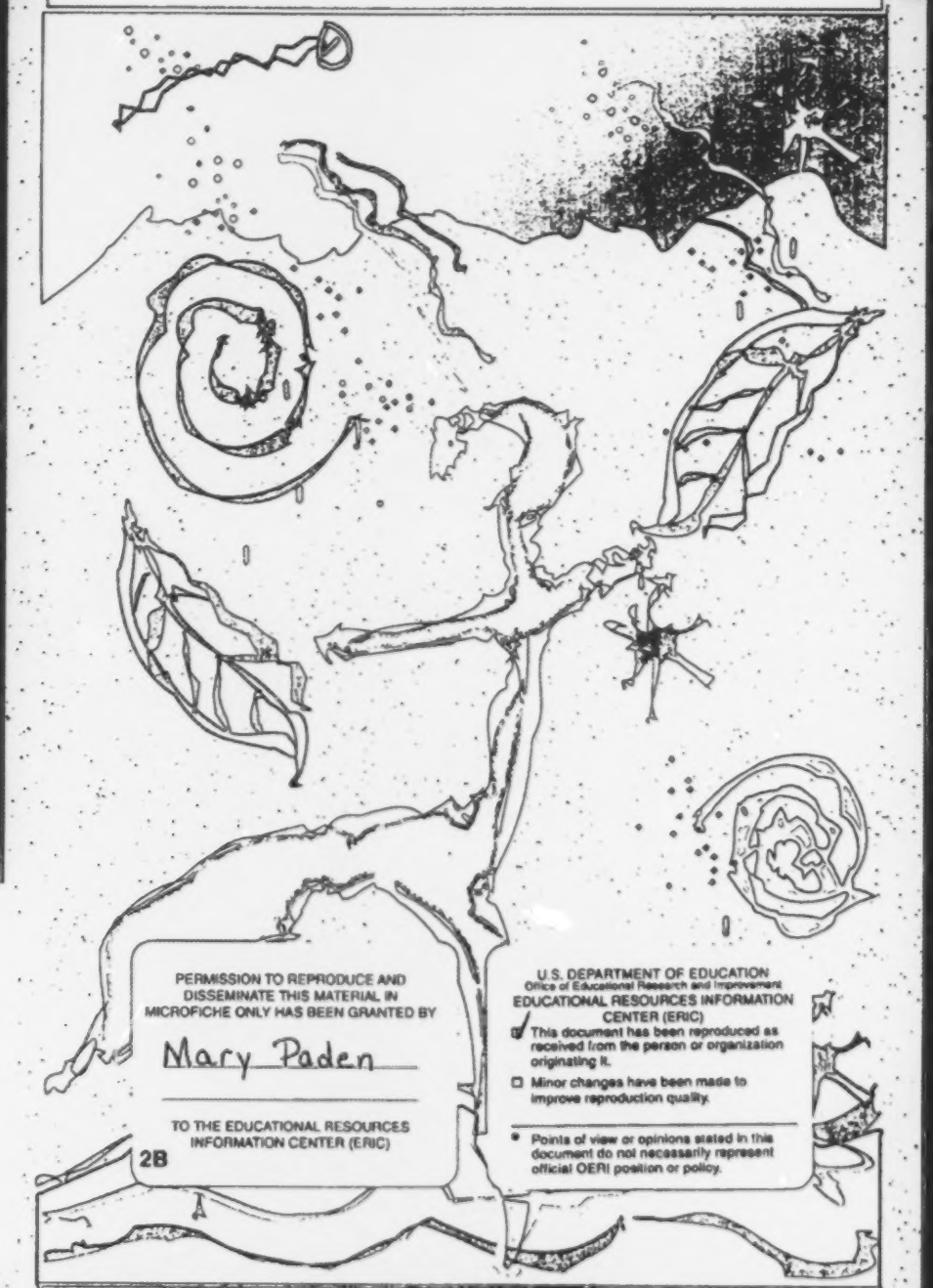
TEACHER'S GUIDE

To World Resources

Two Giants: China & India



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Teacher's Guide

to

World Resources:

Two Giants: China and India

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Teacher's Guide

to

World Resources:

Two Giants: China and India

Comprehensive Coursework on the
Global Environment

World Resources Institute
1709 New York Avenue, N.W., Washington, DC 20006

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The World Resources Institute (WRI) is a research and policy institute helping governments, the private sector, environmental and development organizations, and others address a fundamental question: How can societies meet human needs and nurture economic growth while preserving the natural resources and environmental integrity that make prosperity possible?

Through its policy studies, WRI aims to generate accurate information about global resources and environmental conditions, analyze emerging issues, and develop creative yet workable policy responses. In seeking to deepen public understanding, it publishes a variety of books, reports, and papers; undertakes briefings, seminars, and conferences; and offers material for use in educational settings and in the news media.

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Using World Resources Teacher's Guide Units

World Resources *Teacher's Guide* Units are designed for use at the secondary school level (although we have reports of successful use at the middle school and college levels). They weave together lessons about both environment and development, both globally and locally. They draw on skills and knowledge from the physical and biological sciences, social studies, history, economics, civics, and global studies.

Information and analysis used in the Units are drawn from World Resources Institute (WRI) publications and databases. All units are written by curricula writers and reviewed by educators as well as by technical experts. The Units are updated and revised periodically based on feedback from classroom teachers who have used the materials.

Our intent is to provide easy-to-use, inexpensive classroom materials that contain the most recent and authoritative information on the global environment because we believe it is crucial that the next generation of leaders and citizens understand the issues described here.

The complete set of *Teacher's Guide* Units includes the following topics:

- Biodiversity
- Car Trouble
- Citizen Action
- Energy, Atmosphere, and Climate
- Natural Resource Economics
- Oceans and Coasts
- Population, Poverty, and Land Degradation
- Sustainable Development
- Two Giants: China and India
- Watershed Pollution
- Women, Equity, and Sustainable Development

These units have been revised and updated with the most recent data available as of spring 1994.

Inside Each Unit

Each *Teacher's Guide* Unit should contain enough teaching suggestions and presentation materials to teach one to several classes on the topic without securing additional resources. On the other hand, each unit is designed to point teachers and students to additional resources and to offer suggestions for expanded coursework. Specifically, each unit contains objectives, a lesson plan, student handouts, overhead transparency masters, student enrichment activities, suggestions for further reading, and suggested audiovisual resources.

Using the Units for Environmental Studies

The *Teacher's Guide* Units provide a comprehensive, consistent yet highly flexible set of materials for environmental studies courses. They can be used in conjunction with an environmental science textbook to give students an understanding of basic environmental systems and cycles. Or they can be used in a social studies context to examine some of the tough problems and choices we face as a society.

Educators who want to go beyond the *Teacher's Guide* Units can read related WRI publications, which provide the basic data, source materials, and analysis for the Units. These publications are listed at the beginning of each unit. A free catalog can be obtained by calling 1-800-822-0504.

Integrating Teacher's Guide Units into the Curriculum

Secondary school teachers frequently mention the difficulty of integrating environmental issues into a tightly packed curriculum. As much as they would like to teach about the environment, they must devote class time to required subjects.

To help them place these issues in their curricula, we have coded each lesson plan and each student enrichment activity to the draft national performance assessment standards for science, math, history, civics, and geography. These standards are being developed as part of the national Goals 2000 program in the U.S. Department of Education. The standards themselves are being developed, discussed, and revised by educational organizations in nine academic disciplines. They are expected to be approved at the national level, then offered to states to incorporate into their own academic assessment plans. Although this process will take several years, we have compiled lists of assessment standards for grades 9 through 12 from drafts available in spring 1994 to offer some guidance to teachers.

A complete list of the draft standards for Grades 9 through 12 appears in Appendix B, which should be mailed to you with your order. Appendix A provides a bibliography and list of related organizations. A cover suitable for inserting in a clear-view binder is enclosed with the appendices.

Integrating Global Environmental Education into High School Curricula

In an effort to link lessons about global environment and development issues to required school curricula, we have identified which pages of the lesson plan and which student enrichment activities in this *Teacher's Guide* Unit relate to the draft national performance standards developed recently for civics, geography, history, math, and science in grades 9 through 12.

These voluntary national standards are part of the Goals 2000 program mandated by the Goals 2000: Educate America Act of 1994 under the direction of the U.S. Department of Education. Among other things, Goals 2000 will establish a set of goals or performance standards for grades 4, 8, and 12 in the subjects listed above plus English, the arts, and foreign languages. These goals will be available to the states for incorporation into their own sets of educational performance standards. Each set of draft standards was developed by a professional education organization and has been presented at numerous educational conferences for review and comment. The draft standards used here are those available as of spring 1994.

Although many countries have national performance standards, the United States (and Canada) have treasured a decentralized educational system that sets education goals at the district or state level. Goals 2000 is the first attempt to identify a set of general education objectives that all students in the country are expected to achieve. As might be expected, there is some controversy over whether there should be national education goals—even voluntary ones—and if so, what they should be.

Regardless of the final outcome, we feel the draft goals do reflect some consensus among educators about what material should be covered at various grade levels, and as such, offer some guidance for integrating environmental education into the curricula.

Only those goals relevant to this unit are listed here. A complete list of goals appears in Appendix B. Copies of reports outlining the goals for each subject area can be obtained from the education organizations listed at the top of each set of goals on this page. Information about the Goals 2000 program is available at 1-800-USA-LEARN.

Goals 2000: Draft National Performance Standards

Civics and Government*

(Draft National Standards, October 1993, Center for Civic Education, 5146 Douglas Fir Road, Calabasas, CA 91302-1467)

	Lesson Plan Page Number	Enrichment Activity Number
IV. What is the Relationship of American Politics and Government to World Affairs?		
1. How is the world organized politically?	4, 5	
2. How do the domestic politics and the constitutional principles of the United States affect its relations with the world?		3
3. How has the United States influenced other nations and how have they influenced American politics and society?		3, 4
V. What are the Roles of the Citizen in the American Political System?		
2. What are the rights of the citizen?	5	
3. What are the responsibilities of citizens?	5, 21, 22	
4. How can citizens participate in public life?	5, 21, 22	

Note: Only the education goals relevant to this unit are listed.

Geography*

(Draft National Standards, October 1993, National Council of Geographic Education, Geography Standards Project, 1600 M Street, NW, Washington, DC 20036)

	Lesson Plan Page Number	Enrichment Activity Number
I. Seeing the World in Spatial Terms		
1. Knows and understands how to use maps, globes, and other graphic tools and technologies to acquire, process, and report information from a spatial perspective.	5, 10, 11	3, 4, 6-8
2. Uses mental maps of Earth to put people, places, and environments in their spatial context.		4, 6
3. Knows and understands how to analyze the spatial organization of the Earth's surface.		4, 6
II. Elements: Places and Regions		
4. Knows and understands the physical and human characteristics of place.		2
5. Knows and understands that people define regions and use them to interpret Earth's changing complexity.	5	2
6. Knows and understands that culture and experience influence		

people's perception of places and regions.	5	2
III. Physical Systems		
8. Knows and understands the characteristics and distribution of ecosystems on Earth's surface.	13, 15-17	1
IV. Human Systems		
9. Knows and understands the characteristics, distribution, and migration of human populations on Earth's surface.	4-12	2, 3, 6
10. Knows and understands the nature and complexity of Earth's cultural mosaics.	1-22	2, 3, 7, 8
11. Knows and understands patterns and networks of economic interdependence on Earth's surface.	4, 5, 9, 20	6
12. Knows and understands the processes, patterns, and functions of human settlement.	1-22	2, 3, 6, 8
13. Knows and understands the forces of cooperation and conflict that shape the divisions of Earth's surface.	4, 5	3, 6
V. Environment and Society		
14. Knows how Earth's dynamic physical and human systems are connected and interact.	12-20	2, 6, 7, 8
15. Knows the consequences of the interaction between dynamic human and physical systems.	12-20	2, 6, 8
16. Knows changes in the meaning, distribution, and importance of resources.	1, 12-20	1, 2, 6-8
VI. Applying Geography		
17. Knows and understands how to apply geography to interpret the past.	5	1, 3, 6
18. Knows and understands how to apply geography to interpret the present and plan for the future.	5	1, 3, 6

History*

(Draft National Standards, October 1993, National Center for History in the Schools at UCLA, 231 Moore Hall, 405 Hilgard Avenue, Los Angeles, CA 90024)

	Lesson Plan Page Number	Enrichment Activity Number
I. Historical Chronology		
1. Distinguish between past, present, and future time.	4, 5	3, 7, 8
IV. Historical Analysis		
1. Compare and contrast differing sets of ideas, values, personalities, institutions, etc. by identifying likenesses and differences.	5, 8, 21, 22	2-4, 7, 8
2. Incorporate multiple causes in analysis and explanations of historical action, including the role of chance, the accidental, and the irrational.	5	
3. Assess the importance of the individual in history, of human will, intellect, and character.	5, 21, 22	
4. Demonstrate and explain the influence of ideas, human interests, beliefs and ideologies on individual and group historical actions and their consequences.	4, 5, 21, 22	1-3, 6-8
5. Hypothesize the influence of the past on the present.	5, 21, 22	1-3, 6-8

Mathematics*

(Draft National Standards, March 1989, The National Council of Teachers of Mathematics, Order Processing, 1906 Association Drive, Reston, VA 22091)

	Lesson Plan Page Number	Enrichment Activity Number
I. Mathematics as Problem Solving		
1. Use, with increasing confidence, problem-solving approaches to investigate and understand mathematical content.	5	
X. Statistics		
1. Construct and draw inferences from charts, tables, and graphs that summarize data from real-world situations.	5-7, 10, 11, 13, 15-20	

Science*

(Draft National Standards, February 1994, National Academy of Sciences, National Research Council, 2101 Constitution Avenue, NW, Washington, DC 20418)

	Lesson Plan Page Number	Enrichment Activity Number
III. Life Science		
1. Biodiversity.		1
2. Evolution.		1
4. Ecosystems and Human Ecology.	13-17	1-4
VII. Science and Societal Challenges		
1. Population Growth.	1, 4-22	2, 3, 5, 6
2. Natural Resources.	1, 4, 5, 7-22	1-3, 5-8
3. Environmental Degradation.	1, 4, 5,7-22	1, 2, 3, 5-8
4. Natural and Human-Induced Hazards	5, 7, 9-14 19, 21, 22	3, 6
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Two Giants: China and India

At a busy intersection near the All India Institute of Medical Sciences in New Delhi, a population clock adds about 3,000 babies every hour to the national census count. At this rate, the clock could read over 1 billion by the year 2000, and 1.4 billion by the year 2025, when India would become the world's most populous nation. China currently leads the world, with 1.2 billion people, but China's rate of population growth is slowing more than India's.

These two nations are indeed giants—not only demographically but historically and culturally. Each has a unique civilization, developed over many centuries. Each faces enormous problems in sustaining its population and way of life. Each must speed economic growth without exhausting its environmental resources.

The choices that China and India make in the years ahead will affect not only their own populations but the world's. For example, China's reliance on coal to meet the demand for electricity has implications for any international attempt to cut fossil fuel emissions in the hope of reducing the risk of global warming. China is also the largest producer and consumer of ozone-depleting substances in the developing world. The steps that the Chinese government takes to phase out these substances by the year 2010 as pledged will also contribute to the replenishing of the ozone layer.

This lesson is designed to help students examine some of the challenges faced by these two nations. The lesson is based on Chapter 4, "China," and Chapter 5, "India," of *World Resources 1994–95*. Other chapters and data tables from this report also were used to develop materials in this lesson. Topics covered include population, cities, food production and agriculture, forests and biodiversity, and energy.

Objectives

By the time they finish this lesson, students should be able to:

- Identify the significant development and environment problems faced by China and India.
- Interpret graphs containing data about India, China, and other countries.
- Describe some of the ways in which India and China differ from the United States and Canada and from each other.
- Compare and contrast policies and programs that India and China have developed to address present and future development challenges.
- Discuss some of the choices that India and China will have to make to cope with their increasing populations and explain the importance of these choices.

- Explore ways in which cooperative problem-solving strategies can be used to address development and environment problems.
- Express a sense of appreciation for the traditions and cultural diversity of other countries.

Teaching Strategies

This lesson contains a wealth of up-to-date information and teaching suggestions and offers the teacher maximum flexibility. Materials may be used as a unit or integrated into existing units.

The lesson includes the following materials that may be duplicated:

Student Handouts

1. What's It Like in India?
2. What's It Like in China?
3. India's Population Future
4. China's Population Future
5. Urban Life in India
6. Urban Life in China
7. Food Production and Agriculture in India
8. Food Production and Agriculture in China
9. Maintaining Forests and Biodiversity in India
10. Maintaining Forests and Biodiversity in China
11. India's Energy Prospects
12. China's Energy Prospects
13. Six Megacities
14. Voices of India
15. Voices of China

Overhead Transparency Masters

1. Population, China and India, 1950–2050
2. Population Density
3. Per Capita Cereal Production, 1961–90
4. Degree of Human Disturbance, Vegetated Land Area, 1993
5. Total Energy Use, 1970–91
6. Energy Consumption Per Capita, 1991

Beginning the Lesson

This lesson may be used to study India or China either separately or together. It may also be used to study a specific topic such as population or energy. For example:

- If you are currently teaching a unit on China or on India, you can incorporate some or all of the materials and activities in this Unit in your lesson. There are separate handouts for India and for China including a general profile of each country and country-specific handouts on five topics.

To begin such a lesson, you may want to ask students to spend 15 minutes listing as many facts as they can about the country you plan to study. Then have students read their lists to the class. Compile a class list and encourage students to ask questions. Are the statements really facts? What do students know? What are they unsure of? What else would they like to know? Then distribute copies of **Handout 1, "What's It Like in India,"** or **Handout 2, "What's It Like in China,"** which include maps of China and India with accompanying fact sheets as basic background information about the two countries. Country-specific handouts on some or all of the five topic areas (**Population, Cities, Food Production and Agriculture,**

Forests and Biodiversity, and **Energy**) can be used to develop a profile of environmental and development issues in either country.

- If you are teaching a lesson on one of the five topic areas covered in this lesson plan, you can select materials on China and/or India that illustrate the topic. There are materials for both countries on **Population, Cities, Food Production and Agriculture, Forests and Biodiversity,** and **Energy.**

  To begin such a lesson, refer to the portion of the lesson plan for the topic you have selected. Each topic section of the lesson plan includes data from China, India, the United States, and Canada and discussion points that compare and contrast the four countries.

  There are also overhead transparency masters that correspond to these five topic areas that can be used to begin a lesson on a specific topic. For example, for a lesson on energy, show a transparency made from **Transparency Master 6, "Energy Consumption Per Capita, 1991."** Encourage students to ask questions about the enormous differences between the United States and Canada, on the one hand, and China and India on the other. What could be some of the reasons for the differences? What are some of the implications of the low per capita energy consumption in India and China? Then move to **Handout 11, "India's Energy Prospects,"** and **Handout 12, "China's Energy Prospects."**

- If you want to compare the two countries, you can use any or all of the five topic areas as a basis for comparison. This can be accomplished in several ways.

  You can divide the class into two teams—one to study each country. Create student packets of materials, using the masters for student handouts and the transparencies. Make one packet of materials on China and one on India. Schedule enough time for students to prepare presentations. See the **Suggestions for Further Reading** and **Audiovisual Resources** at the end of this unit for additional materials. After students have given their presentations, discuss the similarities and differences between the two countries, using suggestions in this lesson plan.

  Or, to encourage information-sharing among students, use the "jigsaw" approach in which students can become experts in a particular topic and share that information with a larger group that is building a complete picture of one of the countries. Divide the class into two teams as above—one to study India and one to study China. Then have each team assign members to also be members of one of five topic groups based on the five topics contained in the lesson plan (**Population, Cities, Food Production and Agriculture, Forests and Biodiversity,** and **Energy**). Give each topic group the appropriate materials on that topic for both China and India from the handouts and transparencies. For example, the Cities topic group will have representatives from both the China team and the India team and will receive **Handout 5, "Urban Life in India," Handout 6, "Urban Life in China,"** and **Handout 13, "Six Megacities."** Topic groups will use this information to compare and contrast urban life in India and China. The country team representatives for India in the Cities group will focus on gathering information on urban life in India, and the country team representatives

for China will focus on China. Encourage students to compare and contrast the information on India's and China's cities, noting differences among them and raising questions such as: What can you tell about living standards in the various cities from these statistics? What other information would you need to compare life in the various cities? Country team representatives from the Cities topic group can then take that information back to their country team to add to a country profile of their country.

Why Study India and China Together?

Both China and India are rich in natural resources. But meeting the needs of enormous human populations has put a strain on their resource bases, resulting in land degradation, food and energy shortages, massive deforestation, and a loss of biodiversity. Thus, both countries face many of the same environmental problems.

Both countries have had to allow for continued growth and development while beginning to manage their natural resources. Over the past 50 years, however, China and India have chosen very different paths of economic development. After China's Communist revolution in 1949, the state controlled all economic activity and managed to raise millions of people out of poverty. However, this was done under a blanket of isolation and at great cost to personal liberty, as was demonstrated at the 1989 massacre of protesting students at Tiananmen Square. Since the late 1970s, China has relaxed many of its controls on businesses and is now experiencing an economic boom. Southern China in particular is attracting the interest of international corporations and investors who see China as the world's largest collection of consumers. If or how this new spurt in economic growth will become sustainable development (development that meets present needs without compromising future needs) remains to be seen.

Since its independence from Britain in 1947, India, like many developing countries, has attempted to develop a self-sufficient economic system based on socialism along with a political democracy. It has encouraged the growth of native industries and discouraged imports from other countries that might undersell Indian goods. The "down side" of this economic strategy has been that Indian goods, with the exception of textiles, have not evolved to a competitive level on the world market. Despite its large force of highly educated professionals and its long history as a major trading country, India's economy is growing, but not booming. Economic gains barely keep pace with population growth. Both the absolute number and the percentage of people in poverty has declined slightly over the past 20 years, but India remains a poverty-stricken nation in which 30–40 percent of its people are unable to afford a nutritionally adequate diet. India's major challenge remains to improve the lives of its poor without destroying its resource base.

As two of the world's oldest civilizations, India and China also both have long traditions of art, literature, and religious and political thought that still strongly influence the day-to-day lives of the people. These cultural traditions and philosophies are quite different from those of the

United States and Canada and may be hard for students from other cultures to understand, but these elements of Indian and Chinese life are an important dimension to a complete picture of these countries. Unfortunately, this task is beyond the scope of this unit, but some excellent classroom resources are listed at the end of this lesson plan. For India, it is especially important to discuss some of the basic beliefs of Hinduism and Islam, to describe the long history of invasions of India by Moguls and Muslims, to point out how both Hindu and Islamic beliefs influenced Mahatma Gandhi and other participants in India's nonviolent separation from British rule; and to discuss the partition of India with Muslims forming the new countries of Pakistan and (later) Bangladesh as well as the continuing sporadic violence between Hindus and Muslims.

For China, you might discuss some of the basic ideas of Confucianism and Taoism as well as Buddhism; the splendor of the country's ancient cities; the invasions by Mongols and the construction of the Great Wall of China to keep them out; Marco Polo's visit to China and the opening of trade with Europe; such Chinese inventions as gunpowder, silk, and paper; the famous Chinese dynasties; the breakdown of the last dynasties and the resistance movement of Dr. Sun Yatsen; the communist revolution of 1949 and the rise of Mao Zedong; Communist China's retreat into isolation while it focused on redistributing wealth, increasing agricultural production, and slowing population growth; and finally, the reopening of China, which began in the 1970s and led to the current boom.

To help students envision life in China and India, we have included general fact sheets on each country: **Handout 1, "What's It Like in India?"** and **Handout 2, "What's It Like in China?"** In addition, you may also want to use whatever pictures and videos are available to you to give students a sense of what China's and India's cities and countryside look like, as well as how people live. (See the **Audiovisual Resources** at the end of this lesson for suggestions.) If it is possible to invite people from China and India to class, or have students interview them, this would help students become aware of different perspectives. For general information on India, contact the Information and Culture Wing, Embassy of India, 2107 Massachusetts Avenue, N.W., Washington, D.C. 20008 (202) 939-7065. Information on China can be obtained from the Information Office, Embassy of the People's Republic of China, 2300 Connecticut Avenue, N.W., Washington, D.C. 20008, (202) 328-2510.

A Word About Comparing Countries

The five topic sections of the lesson plan that follow are designed to allow students to learn about India and China by using a large array of information that comes primarily from *World Resources 1994–95*. Each topic section contains a variety of data that have been carefully collected. There are categories of data such as the *total fertility rate*, *average annual production of grain*, or the *per capita use of traditional fuels*. These data are not facts that need to be *memorized*, but, rather, they are useful tools that can be *analyzed*, *compared*, and *contrasted* to provide a sense of what India and China are like, and more specifically, what they are like environmentally. These data are not to be construed as "yardsticks" by which to measure one

country against the other, because, in many ways, these data are based on Western models of development that do not necessarily fit the Eastern criteria for success.

Such quantitative criteria need to be balanced with *qualitative* criteria. Qualitative criteria are much more difficult to enumerate or quantify and are largely subjective. Thus, to conclude the lesson, we have included a selection of readings from Indian leaders, writers, and environmentalists (**Handout 14, "Voices of India,"**) and a selection from Chinese leaders, writers, and environmentalists (**Handout 15, "Voices of China,"**). Teachers may find it useful to read these handouts *before* beginning the lesson to recognize the value of a different world view and the ways in which a variety of points of view influences a people's priorities and a country's decisionmaking.

Population

Two transparency masters can be used to introduce the study of China's and India's populations. **Transparency Master 1, "Population, China and India, 1950–2050,"** shows both past and projected growth as well as the fact that India's population is expected to surpass China's. **Transparency Master 2, "Population Density,"** shows that China and India are among the most densely populated countries in the world. Help students interpret the map correctly by pointing out that the map is based on figures for each country as a whole. Within each country, the population is unevenly distributed. Most of China's population lives in the fertile plains and river valleys of the eastern half of the country. Only 5 percent of the population lives in western China, which is more than half of the country's geographical area. Similarly, in India, population densities vary. In the north, in mountainous Jammu and Kashmir, there are less than 260 people per square mile (100 people per square kilometer) while in West Bengal, there are nearly 2,075 people per square mile (800 people per square kilometer).

Reprinted from *The State of India's Environment 1984–85.*

Facts about population are given in two student handouts: **Handout 3, "India's Population Future,"** and **Handout 4, "China's Population Future."**

The following questions and information should be useful in guiding discussion after students have read the handouts.

- *How do India and China compare in population size?* India and China are the world's population giants. Currently, 16 percent of the world's population lives in India and 21 percent lives in China. With more than 1.19 billion people (mid-1994), China is the most populous country in the world and India is second, with about 911 million (mid-1994). By comparison, the United States has the third largest population, but its population, at 260 million (mid-1994) is much smaller than India's.
- *How fast are the populations of China and India growing?* Both countries have felt the strains of rapid population growth. Between 1950 and 1990, the populations of both India and China more than doubled. The stress this doubling has put on agriculture, cities, energy supplies, and forests is documented in other sections of this *Teacher's Guide* Unit.

Comparing Population In India and China

Unit	China	India	U.S.	Canada
Estimated population, millions, mid-1994 (a) (b)	1,192	911	260	29
Population, millions, 1990 (b)	1,153	846	249	26
Population growth rate (percent change), 1990–95	1.42	1.91	1.03	1.38
Average total fertility rate, 1990–95	2.2	3.9	2.1	1.8
Current total fertility rate, 1994 (a)	2.0	3.6	2.1	1.8
Birth rate (births per 1,000 population), 1990–95	20.8	29.2	15.9	14.2
Life expectancy at birth, years, 1990–95	71	60	76	77
Child mortality (deaths under age 5 per 1,000 live births), 1991	43	131	11	9
Literacy (percent of population literate), 1990 males/females	84/62	62/34	99/99	X
Economic growth rate, GDP, 1980–91 average	9.4	5.4	2.6	3.1
Economic growth rate, 1992 (c)	12.0	4.3	2.6	X

Source: *World Resources 1994–95*, except as otherwise noted.

Notes: a. Population Reference Bureau, *1994 World Population Data Sheet* (Population Reference Bureau, Washington, D.C., 1994). b. China's population is shown in the table in *millions* for consistency. However, this value is more commonly expressed in *billions* (1.19 billion and 1.15 billion). c. The World Bank, *World Tables 1994*, on diskette (The World Bank, Washington, D.C., 1994).

X = Not available.

However, before attempting to make a direct connection between the size of a population and its impact on the environment, it is important not only to examine the size of the population, but to look at the ratio of people to resources as well. The following formula from the *Population, Poverty, and Land Degradation* Unit of the *Teacher's Guide to World Resources* allows us to look at how both population growth and consumption affect the environment.

population size x unit of resources consumed per capita x environmental impact per unit = kinds and levels of environmental impact

In the United States and many other industrialized countries, population growth is small, but per capita consumption is high. As an example, refer to **Transparency 6 "Energy Consumption Per Capita, 1991."** Per capita energy use in the United States and Canada is roughly 10 times that of India and China. Such a pattern produces environmental impacts that include acid rain, toxic waste, and changes in land use patterns. In China, India, and other developing countries, population growth is large, but per capita consumption is low. This pattern often produces environmental impacts such as deforestation and overgrazing. Using this formula, it could be argued that the United States might be the most overpopulated nation considering the consumption patterns of its residents.

- *Why have the governments of both India and China attempted to limit population growth?* Even a population growth rate that sounds small (1.4 for China and 1.9 for India) results in large numbers of people with a population the size of China and India. To demonstrate this, you might ask students calculate 1.4 percent of 1.19 billion. The answer is 16.6 million, which is the same as the population of New York City.

As the populations grow, the resources—arable land, water, forests—don't grow correspondingly; in fact, the resources are more likely to shrink as land becomes degraded, trees are cut down, water becomes polluted, etc.

- *What strategies have India and China used to limit population growth?* Both India and China established official policies to limit population—India in 1959 and China in the mid-1960s— and set up networks of clinics. Both countries have sometimes resorted to coercive measures such as forced sterilization, which have drawn protests. China's communist government is centralized; it makes and enforces policy for the entire country. India is a democracy; to be successful, policies must have political support. Also, the various states have their own governments, so not all decisions are made by the central government.

  China's strict one-child-per-family policy is unique in the world. China has also achieved more success than India in lowering child mortality rates and educating women.

- *What resistance is there to limiting population growth?* In both countries, having children, especially sons, is part of traditional social and religious values. Chinese ancestor worship requires a male heir to carry on the family line. In both China and India, sons also support their parents in old age while daughters leave home to become part of their husband's families. Thus, there is a strong cultural preference for sons, as reflected in the Indian saying, "May you be the mother of a hundred sons."

  Also, rural families in both countries value children as an economic asset: "two hands to work but only one mouth to feed," according to India scientist T. N. Khoshoo. In a 1986 address to the Indian Science Congress Association in Delhi, he noted that poor rural families want to have five children: "One to help in the field, one for domestic chores, one to collect fuel and fodder, one for outside work, and one as a cushion in case of child mortality."

  Birth control is now more socially acceptable in India, although in some states it is still not accepted. In China, birth control is accepted, and the government provides financial rewards to couples who limit themselves to one child. However, the one-child policy has never applied to minorities in China.

- *In what ways does the population of China differ from that of India?* China's population is more homogeneous than India's. Although there are some minorities, most people (94 percent of the population) are Han Chinese. India is one of the most ethnically diverse countries in the world, with religion and language separating people more than ethnic background. About 83 percent of the people are Hindu; they are divided into hundreds of castes. About 76 million Muslims make India one of the largest Muslim countries in the world. Other significant groups include 19 million Christians, 13 million Sikhs, 5 million Buddhists, 3 million Jains, and many different tribal peoples.

  In China, 70 percent of the population speaks standard Chinese, based on the Mandarin dialect, but there are many other dialects. However, all dialects are written the same way, even if they are pronounced differently. So, someone in Beijing, who speaks Mandarin, and someone

in Guangzhou who speaks Cantonese, cannot understand each other's speech, but they can both read the same newspaper. In India, Hindi, the most commonly spoken language, is spoken by only about 30 percent of the population. English is widely spoken by educated Indians, but they make up only about 6 percent of the population. As many as 14 major languages and about 200 minor languages and dialects are spoken in India.

In both countries the population is primarily rural, but increasing numbers of people are migrating to the cities. India's population is more diverse economically than China's, with 30–40 percent of the people living below the poverty level (defined as an income below which a minimum nutritionally adequate diet plus essential nonfood requirements are not affordable). Wealth is more evenly distributed in China. There, only 9 percent of the population lives below the poverty level (United Nations Development Programme, *Human Development Report 1994* (Oxford University Press, New York, 1994)). In the United States, 14.5 percent of the population lives in poverty (United States Bureau of the Census, *Poverty in the U.S., 1992* (United States Government Printing Office, Washington, D.C., 1993)).

- China's people are healthier than those of India. The life expectancy for a baby born in China is 71 years, whereas life expectancy in India is 60 years. (U.S. life expectancy is 76 years; Canada's is the highest of the four—77.) The difference in life expectancy in China and India is partially explained by the difference in child mortality rates. In China, 43 out of every 1,000 children die before their fifth birthday; in India, 131 die before age 5—compared with 11 per 1,000 in the United States, and 9 per 1,000 in Canada. A high child mortality rate, such as India's, is usually indicative of a high level of poverty, poor health care, and poor nutrition. A high child mortality rate is also one of the reasons why people have many children—because they are not sure how many will survive.
- India's gender gap is larger than China's. Until recently, only male children in India could inherit the family name and fortune.
  Under communism, China has made a big effort toward equality for males and females. In India, the situation varies by state: in the southern state of Kerala, females have almost equal education and opportunities with men. However, in many poorer northern states, there are still occasional burnings of brides whose families cannot pay their dowries. The government recently began to reserve one third of the seats in local self-government institutions for women.

  Literacy rates in China are 84 percent for males and 62 percent for females; in India, they are 62 percent for males and 34 percent for females—a much wider gap. There is no difference between males and females in literacy rates in the United States; both are considerably higher than in India and China—99 percent.
- *How are India and China trying to meet the challenge of their growing populations?* Economic growth is essential, and both countries are engaged in economic reforms. China's economy is growing at twice the rate of India's. (China's average is about 9.4 percent per year versus 5.4 percent for India.) With restrictions on private entrepreneurs being lifted,

China is experiencing an economic boom. Hundreds of foreign companies are rushing to China looking for sales to its 1 billion consumers. India is growing more slowly, and wealth within India is less evenly distributed.

Cities

Use **Handout 5, "Urban Life in India,"** and **6, "Urban Life in China,"** and **Handout 13, "Six Megacities,"** to compare the urban life of China and India. After students have read the handouts, use the following questions and information to guide the discussion.

- *Why are cities growing in India and China?* As is the case throughout the world, rural people in China and India move into cities in search of a better life. When people move into urban areas, they hope to gain job opportunities, increased income, and better access to health and education facilities. But hopes are often not realized and citizens sometimes end up in a much worse condition living in slums or on the streets. Migration to cities sometimes also occurs because of the displacement of people by development projects. Both India and China currently have large dam projects (the Narmada Dam in India, and the Three Gorges Dam in China) that will require the resettlement of huge numbers of people—more than 1 million in each country.

  Thirty years ago, city-dwellers made up about 18 percent of the population of each country. Today, urbanites account for 30 percent of China's population and 27 percent of India's. By contrast, 76 percent of Americans and 78 percent of Canadians live in cities today. Point out to students that rural-urban migration also occurred in North America earlier in this century.

Comparing Cities in India and China

Unit	China	India	U.S.	Canada
Estimated population, millions, mid-1994 {a} {b}	1,192	911	260	29
Population, millions, 1990 {b}	1,153	846	249	26
Urban population as percent of total population, 1965	18	19	72	73
Urban population as percent of total population, 1995	30	27	76	78
Number of cities with more than 750,000 people, 1990	51	34	43	4
Average annual population change, percent, 1965–95, Urban/Rural	3.5/1.2	3.3/1.8	1.2/0.5	1.5/0.5
Persons per room, 1989	1.2–2	3–4.2	0.5	X
Persons per vehicle, 1991	191	185	1	2
Ratio of bicycles to autos, 1991 {c} {d}	265	80	0.87	X
Persons per bike, 1991–92 {d}	2.6	17	2.1	X

Source: *World Resources 1994–95,* except as otherwise noted.

Notes: a. Population Reference Bureau, *1994 World Population Data Sheet* (Population Reference Bureau, Washington, D.C., 1994). b. China's population is shown in the table in *millions* for consistency. However, this value is more commonly expressed in *billions* (1.19 billion and 1.15 billion). c. Bike Institute of America, *International Bicycle Market Statistics* (Bicycle Institute of America, Washington, D.C., 1994). d. American Automobile Manufacturer's Association (AAMA), *World Motor Vehicle Data* (AAMA, Washington, D.C., 1993).

X = Not available.

- *What are some of the major cities in China and India?* China and India have lots of cities. China has 51 cities of more than 750,000 residents; India has 34. (The United States has 43; Canada has 4.) Each has three megacities—urban areas projected to have populations of at least 10 million each by the year 2000. China's capital, Beijing, is about the size of Los Angeles both in physical size and population. Shanghai is the most populous city, with more than 13 million residents. (New York has 16 million.) India's capital, New Delhi, is its smallest megacity and is comparatively calm and spacious compared to the teaming port cities of Calcutta and Bombay at 10 and 12 million, respectively. Whereas the population of New York appears to have stabilized, the cities of China and India are growing fast. By 2000, Shanghai and Bombay will be larger than New York.
- *What are living conditions like in the cities of India and China?* In large Indian cities, such as Calcutta, Bombay, and Delhi, one third to one half of the population lives in slums and squatter settlements. In China, the incomes and living standards of urban dwellers are two to three times higher than in the countryside. Many urban dwellers have secure state jobs with government-owned housing. Some cities are booming as economic reforms encourage foreign investment. In Shanghai, for example, the Chinese government is investing billions to build a new port, bridges and expressways, a second airport, and high-rise buildings.

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- Most Chinese and Indian cities are more tightly packed than North American cities. For example, in Chinese megacities, 1 to 2 people inhabit each room; and in Indian megacities an average of 3 to 4 people live in each room. (U.S. megacities average 2 rooms for every person.) Point out to students that perceptions of crowding are culturally relative and that what might be considered overcrowded conditions in one culture would not be considered so in another culture.
- Cars are not the norm in China and India—they are well beyond the means of most people. However, the streets are still crowded. In India, a motorscooter is the equivalent of a compact car for a working class family of four. China has 191 people per motor vehicle; India has 185 (compared to 1 person per vehicle in the United States and 2 in Canada). Chinese and Indians rely on motorscooters, bicycles, public transit (where available), and their own feet. In China, the ratio of bicycles to cars is 265:1; in India, it is 80:1. (In the United States, there are slightly more cars than bicycles.) For bicycle owners in India and especially in China, the bicycle is not used for recreation or even as an alternative means of transportation; it is a primary means of transportation.
- The ratio of people to telephones shown in **Handout 13, "Six Megacities,"** is also an interesting contrast. In China and India, there are between 2 and 5 telephones for every 100 people; in New York and Los Angeles, there are from 35 to 56. The percentage of urban households with electricity in China is roughly comparable to that in the United States (90–95 percent in China, and 98–100 percent in the United States). However, the percentage is much lower in Indian cities (63 percent in Calcutta, and 78 percent in Bombay).
- *How would you rate the air quality in India and China?* Air pollution in India's and China's cities is bad and getting worse. Beijing is one of the world's seven megacities with the worst air pollution. (So is Los Angeles.) Coal burning in China releases sulfur dioxide and nitrogen oxides and suspended particulates that put many Chinese cities well over World Health Organization (WHO) clean air guidelines. (World Health

Reprinted from *The State of India's Environment 1984–85.*

Organization, *WHO Expert Committee on Air Quality Criteria and Guides for Urban Air Pollutants,* WHO Technical Report Series No. 506, (WHO, Geneva, 1972).) Deaths from respiratory disease caused by air pollution and cigarette smoking are five times higher in China than in the United States. Air quality is also poor in Delhi. In both countries, lead from leaded gasoline poses health risks to urban children.

- *To what extent do city dwellers in India and China have access to water and sanitation?* While most U.S. cities have clean drinking water and sewage treatment—so important for health and environmental protection—these amenities are often out of reach for many in Chinese and Indian cities. In China, most urban dwellers have access to sanitation services (usually sewers); however only 19 percent of the municipal wastewater is treated. In India, sanitation services are available to only 44 percent of the urban population (less in India's many urban squatter settlements). Safe drinking water is available to slightly more than 85 percent of the urban populations in both countries, but most residents routinely boil drinking water to kill bacteria. Among wealthier citizens, bottled water is often used for drinking water at home.
- *What steps are being taken to deal with air and water pollution?* In both countries, pollution is so extensive that it would be an enormous and expensive job to deal with it. Efforts to tackle environmental problems in China have yielded some results but are hampered by lack of financial resources. Some Chinese cities such as Benxi are trying to clean up their air by encouraging the use of natural gas instead of coal, and fining factories that create pollution. China has developed national standards for the discharge of water pollutants, and polluters are fined; however, fines are low.

  The Indian government has developed plans to clean up some of its rivers, including a massive plan for the Ganges River.

Food Production and Agriculture

Use **Handouts 7, "Food Production and Agriculture in India,"** and **8, "Food Production and Agriculture in China"** and **Transparency 3, "Per Capita Cereal Production, 1961–90,"** to compare the task of food production in China and India. After students have read the handouts and viewed the transparency, use the following questions and information to guide the discussion.

- *What resources do China and India have to produce food for their growing populations?* With nearly as much cropland as the United States, India must feed four times as many people; with about half as much cropland as the United States, China must feed five times as many people. Although China is a much larger country, India has almost twice as much cropland. China has only 0.19 acres (0.08 hectares) of cropland per person. In both countries, land has been cultivated intensively for thousands of years. Today, traditional farming practices coexist with sophisticated technology, but the trend is toward Western-style commodity agriculture, and away from subsistence farming. Both countries have large agricultural workforces: 67 percent of the Chinese population is involved in agriculture and 60 percent in India, as compared with 2 percent of the U.S. labor force and 3 percent of the Canadian. Both India and China have large livestock populations and rely heavily

Comparing Food Production and Agriculture in India and China

Unit	China	India	U.S.	Canada
Estimated population, millions, mid-1994 {a} {b}	1,192	911	260	29
Population, millions, 1990 {b}	1,153	846	249	26
Total land area, million hectares, 1991	932	297	916	922
Total cropland, million hectares, 1991	96	169	187	45
Cropland, hectares per capita, 1991	0.08	0.20	0.74	1.73
Average annual production of cereal grain, million metric tons {c}	399,927	196,173	315,486	52,855
Average yields of cereals, kilograms per hectare, 1990–92	4,329	1,935	4,881	2,531
Grain fed to livestock as percentage of total grain, 1992	19	3	69	75
Cattle, annual average, millions, 1990–92	79,455	192,576	9,887	212,698
Irrigated land as a percentage of crop land, hectares, 1989–91	49	27	11	1
Average annual fertilizer use, kilograms per hectare of crop land, 1989–91	284	73	99	46

Source: *World Resources 1994–95*, except as otherwise noted.

Notes: a. Population Reference Bureau, *1994 World Population Data Sheet* (Population Reference Bureau, Washington, D.C., 1994). b. China's population is shown in the table in *millions* for consistency. However, this value is more commonly expressed in *billions* (1.19 billion and 1.15 billion). c. Cereals include all grain cereals (wheat, rice, barley, oats, etc.) harvested for dry grains—not hay or harvested green.

on animals for agricultural work. Both have extensive systems of irrigation. India depends heavily on the monsoon rains for water.

- *What foods are the basis of the Indian and Chinese diet?* In both countries, the diet is grain-based: in some areas, rice is the staple crop and in others, wheat is the basis of the diet. In both countries, the diet is typically vegetarian. In India, dietary rules of various religions forbid the eating of some or all animal flesh. The Chinese eat meat if it is available and affordable, but in small amounts. Thus, the grain that is raised in both countries is mainly for human consumption. Only 3 percent of the grain in India is fed to livestock, and only 19 percent of the grain in China. In the United States, 69 percent of the grain is fed to livestock, which are then consumed by humans. In the United States, the most numerous type of livestock is cattle (99 million head), whereas China has more pigs than any country in the world (370 million). India is the world leader in cows, with 193 million; however, these cows are not slaughtered for beef because the Hindu religion prohibits it. Rather, they are used for milk, cheese, dung for fuel, and as draught animals.
- *What are the implications of eating low or high on the food chain?* When we eat grains, we are eating low on the food chain because we are consuming substances that use energy from the sun to produce food directly. Each transfer point in the energy cycle (from sun to plants, plants to animals, and animals to humans) involves energy losses. Less and less energy is available and thus, more and more quantities are required to supply energy. The losses are often about 90 percent from one level to the next, so only about 10 percent of the energy in one consumer level is usable by the next level. When we eat beef or poultry, we are consuming substances that have in turn had to consume grain to provide a source of energy—this is eating high on the food chain. Populations that eat a lot of meat require a much larger production of grain per capita. The diets of both Indians and Chinese are rich in grains and vegetables with only small amounts of meat.

- *What methods have China and India used to increase the amount of food they produce?* Which country has been more successful? Beginning in the mid-1960s, India experienced a dramatic increase in agricultural output. The Green Revolution, which was occurring not only in India, but worldwide, depended on the widespread use of new high-yield varieties of seeds that required large amounts of chemical fertilizers, pesticides, and irrigation.

  In India, the use of pesticides increased almost 3.5 times between 1970 and 1990. Nearly 70 percent of the pesticides used in India, including DDT, aldrin, and methyl parathion are banned or severely restricted in some other countries.
- China's cereal grain yields are double that of India. China's average cereal production is comparable to that of the United States; however, China achieved this output on only half the cropland area.
- China has high yields because it has developed an extremely intensive system of agriculture that some experts predict may damage the soil and lower yields in the future. For example, China has irrigated almost half of its cropland (49 percent), compared with 27 percent in India and 11 percent in the United States. It uses 253 pounds of fertilizer per acre (284 kilograms per hectare) compared with 65 pounds (73 kilograms) in India, 41 pounds (46 kilograms) in Canada, and 88 (99 kilograms) in the United States.
- *What are some of the environmental problems affecting food production in India and China?* Intensive farming can, over the long term, reduce the productivity of farmland. Both Chinese and Indian officials consider land degradation one of their major environmental problems. China is losing farm productivity because of desertification, salinization, and waterlogging (caused by improper drainage of irrigation water) and the depletion of organic matter caused by overuse of chemical fertilizers and planting too many crops per year. About 210 million acres (85 million hectares) of India's farmland is affected by soil degradation, which seriously affects agricultural production (*World Resources 1994-95*, p. 90). In addition, both countries suffer from serious water pollution caused by soil and excess fertilizers, herbicides, and pesticides being washed into rivers.
- *What can China and India do to produce enough food for their future populations?* The challenge is to raise the productivity of existing farmland without degrading the resources: soil, water, etc. India and China are working to increase average yield through intensive farming, water, and soil management techniques, use of fertilizers, pesticides in appropriate amounts, and high-yield seeds.

Forests and Biodiversity

Use **Handouts 9, "Maintaining Forests and Biodiversity in India"** and **10, "Maintaining Forests and Biodiversity in China."** You might begin the discussion by showing **Transparency Master 4, "Degree of Human Disturbance, Vegetated Land Area, 1993."**

The percentage of land that has been highly disturbed by human use is higher for India (55 percent) than for China (33 percent). However, China, with its vast uninhabitable western mountain ranges and dry lands, retains 32 percent of its land area with low disturbance while India has only 2 percent in that category.

Comparing Forests and Biodiversity in India and China

Unit	China	India	U.S.	Canada
Estimated population, millions, mid-1994 {a} {b}	1,192	911	260	29
Population, millions, 1990 {b}	1,153	846	249	26
Total land area, million hectares, 1991	932	297	916	922
Forested area, million hectares, 1992 {c}	130	68.5	286	361
Forest cover (percent of total land area), 1992 {c}	14	23	31	39
Percentage of total land area highly disturbed	33	55	39	2
Percentage of total land area with low disturbance	32	2	25	92
Percentage of land in protected areas	3.2	4	10.5	5
Number of plant species	32,200	16,000	19,473	3,270
Number of threatened mammal species	40	39	27	5
Number of threatened bird species	83	72	43	6
Number of threatened plant species	307	1,331	2,279	700

Source: *World Resources 1994–95*, except as otherwise noted.

Notes: a. Population Reference Bureau, *1994 World Population Data Sheet* (Population Reference Bureau, Washington, D.C., 1994). b. China's population is shown in the table in *millions* for consistency. However, this value is more commonly expressed in *billions* (1.19 billion and 1.15 billion). c. Food and Agriculture Organization of the United Nations (FAO), *Agrostat PC*, on diskette (FAO, Rome, 1994).

Data on human disturbance have been extracted from map-based data taken from various atlases; maps of human and livestock population densities; maps of land use and forest cover; desertification estimates; and other sources portraying human infrastructure.

Explain the meaning of the following terms:

- Areas of *low human disturbance* are covered by natural vegetation or have a population density under 25 people per square mile (10 people per square kilometer) or under 2.5 people per square mile (1 person per square kilometer) in arid, semiarid, and tundra regions.
- Areas of *medium human disturbance* are under shifting or extensive agriculture, or contain secondary, naturally regenerating vegetation; have a livestock density exceeding their carrying capacity; exhibit other evidence of human disturbance (e.g., contain a logging operation); or otherwise do not fit into the other two categories.
- Areas of *high human disturbance* are under permanent agricultural cultivation or urban settlement, or contain primary vegetation removed without evidence of regrowth; contain current vegetation differing from potential vegetation; have a record of desertification or other permanent degradation.

Encourage students to ask questions and suggest answers. Or use the following questions:

- *Why does China have a much higher proportion of land with low disturbance than India does?* China has vast uninhabitable western mountain ranges and dry lands; most of the population lives in the eastern half of the country. In India, the population is more evenly distributed, and almost no land is left untouched by humans.
- *Why is so much of the land in Canada relatively undisturbed?* Canada is the second largest country in the world, but much of the colder, northern portions of the country are uninhabited. More than three quarters of

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the population live in cities—most of which are located just north of the United States.

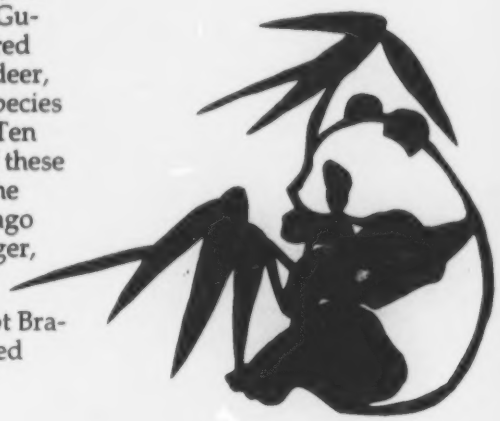
- *Which countries have the smallest percentage of relatively undisturbed land?* India has by far the smallest; then the United States.
- *What difference does it make whether a country has a high or low level of human disturbance?* The greater the human disturbance, the more pressure on natural vegetation and biodiversity of plant and animal species. Figures on human disturbance are used as an indication of habitat loss, based on the assumption that human activity is associated with the conversion of natural habitat to other uses (forest to farmland, for example). Human activities also fragment and degrade natural habitat.

Use the following questions and information to guide the discussion:

- *How do China and India compare in forest resources?* China has more total forest—321 million acres (130 million hectares), compared with 170 million acres (69 million hectares) for India—but because India is smaller, its forests cover a slightly larger percent of its total land area—23 percent, compared with 14 percent for China.
- All of these forests are much decreased from their original extent: India's original forest habitat has declined by 78 percent, China's original forest habitat by 99 percent, and the United States' original forest habitat by 95–98 percent.
- Both China and India have lost a great deal of forest area during this century, but have now stabilized their forest area and are even showing modest increases.
- However, much of the forest in both countries is degraded in some way or is being cultivated for commercial/industrial use. Small amounts of original forest habitat can be found only in remote areas of China. Although total forest cover is increasing in China, the native populations and genetic diversity of China's natural forests continue to decline because many of the newly planted trees are monoculture species (single species cultivated on plantations) that are not native to the region.
- In both countries, people use forests for fuelwood, grazing, and other uses in addition to logging. Most of the forests are publicly owned. In India, forests were traditionally managed by nearby villages, a responsibility that was taken over by the government during colonial rule and is now being experimentally restored to some villages.
- *What is the place of the Chipko movement in preserving forests?* The Chipko movement started in the 1970s as a direct action by local people to protect their natural resources. Many previous campaigns have been waged by Indians to protect natural resources, including Mahatma Gandhi's well-known salt march in the 1930s in which Gandhi led tens of thousands of marchers to Dandee to pick up salt from the beach after the British had tried to take control of the mineral and privatize it—blocking Indian citizens' free access to this natural resource.

There is a longstanding tradition in India that local communities are the most knowledgeable and best equipped to manage the resources on which their survival depends. Furthermore, Indians believe that the forests are common property and they should not become a commodity managed by the state or other outside influences.

- *What is being done in India and China to protect biodiversity?* China has placed 3.2 percent of its land area in 600 protected areas for wildlife preservation; India has protected 4 percent of its land in 331 reserves. (The United States has protected 10.5 percent of its land.)
- Both countries have many diverse and amazing species to protect. India is famous for its tigers, which numbered 40,000 at the turn of the century and now number about 1,300. They are protected by 19 reserves. Other reserves have been established to protect India's 20,000 elephants. The Asiatic lion is being protected in the Gir forest in Gujarat, which is its only remaining natural habitat. Other endangered mammals include the snow leopard, the musk deer, the swamp deer, the rhino, and the wild ass. Twelve percent of India's mammal species are threatened with extinction (*World Resources 1994–95*, p. 322). Ten percent of China's mammals are threatened. The most famous of these is the giant panda of which only 1,000 are thought to remain in the wild (Schaller, George B., *The Last Panda* (The University of Chicago Press, Chicago, 1993)). Other threatened mammals include the tiger, snow leopard, white-lip deer, golden monkey, and green turtle.
- China has more species of plants (32,200) than any country except Brazil and Colombia. India has 16,000 species of plants and the United States has about 19,500.



Energy

Use **Handouts 11, India's Energy Prospects,"** and **12, "China's Energy Prospects,"** and **Transparencies 5, "Total Energy Use, 1970–91"** and **6, "Energy Consumption Per Capita, 1991,"** to compare the two countries' energy use and resources. The transparencies will be helpful in introducing the topic, as suggested below, and additional information and questions are provided for guiding discussion of the handouts.

Use **Transparency 5, "Total Energy Use, 1970–91"** to show how China and India compare to each other and to the United States and Canada. [Note: Energy use is measured in metric units called joules. One joule equals 0.0009478 British thermal units (Btus), and is about as much energy as in one struck match. This graph measures use in exajoules: one exajoule is 1 quintillion (1,000,000,000,000,000,000) joules.]

The graph in **Transparency 5** shows that China uses much more energy than India and that, while energy use in both countries has grown, the increase in China was much greater than in India. Even though China and India have much larger populations than the United States, their total energy use is much less.

To examine per capita energy use, use **Transparency Master 6, "Energy Consumption Per Capita."** [Note: This graph uses a different, smaller unit of measurement. Energy consumption per capita is expressed in "gigajoules." One gigajoule is 1 billion (1,000,000,000) joules.] Explain that the term "commercial energy" refers to energy that is produced from coal, oil, natural gas, nuclear power, etc., and the term "traditional energy refers to energy produced by burning wood, crop waste, dried animal dung, etc.

Comparing Energy Use in India and China

Unit	China	India	U.S.	Canada
Estimated population, millions, mid-1994 {a} {b}	1,192	911	260	29
Total population, millions, 1990 {b}	1,153	846	249	26
Total commercial energy use, petajoules, 1991	27,345	8,011	80,839	8,779
Percent change in total commercial energy consumption since 1971	66	107	17	53
Per capita energy use, gigajoules, 1990	23	9	320	325
Total consumption of traditional fuels, petajoules, 1991	2,018	2,824	916	67
Traditional fuels as a percentage of total consumption, 1991	7	26	1	1
Per capita use of traditional fuels, gigajoules, 1991	1.7	3.3	2.5	3.6
Percent of total commercial energy supplied by coal, 1991 {c}	81.8	70.8	22.6	5.4
Percent of global CO_2 emissions, 1991	11	3	22	2

Source: *World Resources 1994–95*, except as otherwise noted.

Notes: a. Population Reference Bureau, *1994 World Population Data Sheet* (Population Reference Bureau, Washington, D.C., 1994). b. China's population is shown in the table in *millions* for consistency. However, this value is more commonly expressed in *billions* (1.19 billion and 1.15 billion). c. United Nations Statistical Division (UNSTAT), *U.N. Energy Tape* (UNSTAT, New York, 1992).

Like other developing countries, India and China use much less energy than developed countries; they also rely on traditional energy sources, especially in rural areas.

- *Why is the per capita energy use so much smaller in India and China than in the United States and Canada?* Developing countries have two types of energy consumers. People in rural areas rely heavily on traditional biomass fuels—wood, crop waste, and animal dung. The rural economy is subsistence-based and has little access to commercial fuels and services. Animal and human muscle contribute much of the labor for agriculture and transportation. People gather fuelwood for cooking and heating; fuelwood is also used to power some industries. In contrast, city dwellers use commercial energy. Urban areas have sizeable industries, utility grids, and fuel distribution systems.

Thus, both India and China are very different from the United States and Canada where access to commercial energy is typical. Even poor rural people in North America have access to electricity and gasoline-powered motor vehicles; in rural India and China, people in the country are apt to use stoves that burn wood or dung and drive carts drawn by animals.

The American and Canadian lifestyle is built around heavy use of commercial energy in the household and the workplace, as well as for transportation. There is 1 motor vehicle for each person in the United States, and 2 for each person in Canada. In India, there is 1 vehicle for every 185 persons, and in China, 1 for every 191 persons. [Note: figures include both private and commercial vehicles.]

Both countries have substantial coal and oil reserves. Coal provides more than 80 percent of all commercial energy in China, and about 70 percent in India. India relies more heavily on oil than China, and spends about one quarter of its foreign exchange earnings on imported oil. Natural gas is the source of only a small part of each country's energy.

- *Are India and China currently meeting their energy needs?* In both countries, production problems result in energy shortages that limit their industrial production and cause residential "brownouts" (*World Resources 1994–95*, pp. 67 and 101). (Brownouts are periods when electricity levels drop and lights dim—unlike a full blackout, when electricity is lost completely.) Both countries have problems transporting coal by rail from areas where it is mined to the areas where it is used.
- Both countries are rapidly increasing their use of energy. China's energy has increased 66 percent since 1971 and India's use has doubled (107 percent). These increases are typical of the more advanced developing countries.
- *What role does the construction of dams play in the future energy resources of both India and China?* Both countries have major dam projects currently underway which could be major sources of electricity but which will displace large numbers of citizens and result in the loss of considerable forestland and wildlife habitat.

  The Narmada Valley Project could provide 1.4 million kilowatts of electricity. However, there have been massive protests because plans to resettle and rehabilitate nearly 1 million citizens who would be displaced by the dam project have been poorly designed; many question whether there is even enough resettlement land available for this many people.

  The Three Gorges hydroelectric project on the Yangtze (Changjiang) River will be the world's largest and most complex hydroelectric dam with a capacity of 17 million kilowatts. Its projected annual power generation of 84 billion kilowatt-hours is equal to the power produced by 40–50 million tons of coal. There is considerable opposition both within and outside China because of the social impact of the project. According to estimates, 1.1 million people would be displaced. The dam would also destroy some well-known scenic spots that are important sources of tourism.

- Both countries have room to make major improvements in how efficiently their industries use energy. For example, China's industries consume 30–90 percent more energy than similar industries in industrialized countries (*World Resources 1994–95*, p. 67). More than 20 percent of India's electricity is lost during transmission and distribution.

  Both countries use at least twice as much energy to manufacture steel as industrialized countries use. And both countries keep the price of energy low, which provides little incentive for users to conserve it.

- *How will China and India meet their future energy needs?* Although both China and India currently use much less energy than industrialized countries, the projected growth of their large populations, plus hopes of increasing per capita energy use, trigger forecasts of substantial increases in energy use. Estimates show a two- to threefold increase in energy use in China by 2025, and a fourfold increase in India. (*World Resources 1994–95*, p. 66).
- China has invited foreign oil companies to help exploit its oil resources; however, most of China's increased energy use will come from burning coal, which both contributes to global warming and produces local air pollution. Air pollution is a serious threat to health in China, especially in cities where coal is used in cooking and heating stoves. Unless alternate fuels and more energy-efficient stoves are

Reprinted from *The State of India's Environment 1982*.

used, air quality will only worsen. The "standard" death rate from chronic obstructive pulmonary disease (which is linked to exposure to particulate matter, sulfur dioxide, and cigarette smoking) is five times higher in China than in the United States (*World Resources 1994–95*). China now contributes 11 percent of the global emissions of carbon dioxide compared with a 3-percent share for India and 21 percent for the United States.

China has signed global agreements to try to curb its carbon emissions by conserving wasted energy and by switching to oil and natural gas where possible; however, its primary commitment is to its economic growth (*World Resources 1994–95*, p. 60).

- Both China and India have great potential for use of renewable energy, especially in rural areas. Both countries have made efforts to support renewables, but much remains to be done. India has the largest solar cooker program in the world, with over 238,000 solar cookers sold at the end of 1992. Solar collectors, wind turbines, and small-scale hydropower are being developed in rural areas. China also has wind energy farms, photovoltaic factories, and small hydro dams, but investment in renewables is only a small fraction of total energy investment (*World Resources 1994–95*, p. 69).

Concluding the Lesson

To conclude the lesson, we have provided two sets of student handouts: **Handout 14, "Voices of India,"** and **Handout 15, "Voices of China."** All the selections come from native writers of the two countries. The selections are designed to move away from a purely Western point of view and help students begin to understand that the Chinese and Indians have their own cultural perspectives. The readings come from both the official government and private individuals.

The handouts are a beginning point for further study and research. We have attempted to choose selections that fit together so that there would be grounds for comparison and contrast.

In discussing these selections with students, the main ideas to emphasize are:

- Both China and India have increasing populations, diminishing resources, and environmental pollution and degradation.
- Both are currently experimenting with economic reform, and are gradually giving up state-owned enterprise and shifting to a market economy.
- Both are seeking their own way of development that fits in with their own values and traditions; yet, both are inviting in foreign investors, undergoing Western-style development, and becoming more a part of the global economy.
- Each has a unique history and way of looking at things. China has accomplished much through struggle; the Chinese emphasize hard work as a way to deal with environmental problems. In China, the government dominates efforts to improve the environment.
- In India, there is great diversity, wealth, and poverty. There is also a spiritual concern for the environment. There are also many grassroots

movements; individuals and NGOs, as well as government agencies, are influencing environment and development.

The following questions and information can be used to discuss the readings:

- *What do you think is the best development path for each country?*
- *How can a country meet the needs of its people and yet preserve the environment in which they live?*
- *Who should provide leadership in the development process?*
- *What values are expressed by the writers? What ideas seem new or different?*
- *Are there any similarities between the views of Indians and Chinese in these selections? In what ways do they differ from each other?*

Voices of India

- *Selection 1:* Prime Minister Indira Gandhi's statement on the environment was published by the Indian Department of the Environment in 1984, the year she was assassinated.
  Mrs. Gandhi addresses the question of meeting the needs of India's people without ruining the environment. She calls on Indians to find paths to development that are their own, that do not imitate Western models, urging them to seek for a way to be at peace with each other and with nature. She questions consumerism as a means of happiness and defines progress as increased spiritual fulfillment.
- *Selection 2:* This selection comes from the report of the Indian government to the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil.
  Echoing Prime Minister Gandhi, the report stresses that Indians must come up with their own solutions to the problems of poverty and environmental degradation rather than mimic the West. The report cites the increasing number of individuals and communities that are taking actions to improve life for Indians and protect the environment.
- *Selection 3:* This saying by Mahatma Gandhi is often quoted. He expresses the conviction that if people lived simply, there would be enough of Earth's resources to go around.
- *Selection 4:* This selection describes India's poor, suggesting that the culture of the poor should be the paradigm for development. It would make a good companion piece to the film, *City of Joy*. (See **Student Enrichment Activity 2.**) The author believes that development projects that displace the poor are destructive; that successful development must allow the poor space and build on their natural relationship with the environment.
- *Selection 5:* The final selection presents the views of Vandana Shiva, a scientist, international environmental activist, author, and Director of the Research Foundation for Science, Technology, and Natural Resource Policy in Dehra Dun, India. She studies new technologies and conflicts over natural resources.

  Shiva also is critical of development projects that displace local peoples, pointing out the crucial link between communities and the health of the environment. She believes that people must say "no" to the wrong kind of development in order to bring about the right kind.

Voices of China

- *Selection 1:* The first selection is taken from the 1992 Official Report of the People's Republic of China on Environment and Development. Citing the progress of the last 5,000 years, the Chinese government gives priority to economic development, but calls for environmental protection. China's goals are prosperity and socialist modernization; achieving these goals will be an arduous task.
- *Selection 2:* This 1993 news release discusses an unprecedented mass media campaign, organized by the government and national news organizations, to publicize China's environmental problems instead of concealing them.

  The campaign slogan reveals the Chinese way of taking the long view, noting that environmentalists' "work will benefit the country for thousands of years." The campaign has a martial theme—war against environmental pollutants—and praises the Chinese people for their determination to clean up the Earth.
- *Selection 3:* Specific environmental problems are listed in the third selection, a press release. The title uses the phrase, "Chinese people have to fight for their surviving," echoing the warlike language of the previous selection.
- *Selection 4:* This selection begins with a gloomy view of the world environment, saying that "we may lose our battle for survival." The authors criticize the wasteful way of life of the "First World" and don't want China to adopt a Western life style. They criticize the Western philosophy of life for wanting to "have" rather than "be."

  They include in their article part of a speech by a Buddhist, arguing that environmental pollution is a problem of the mind, caused by greed and the desire to possess. People today need a new set of values, and they should study the past to find eternal values.

Suggestions for Further Reading

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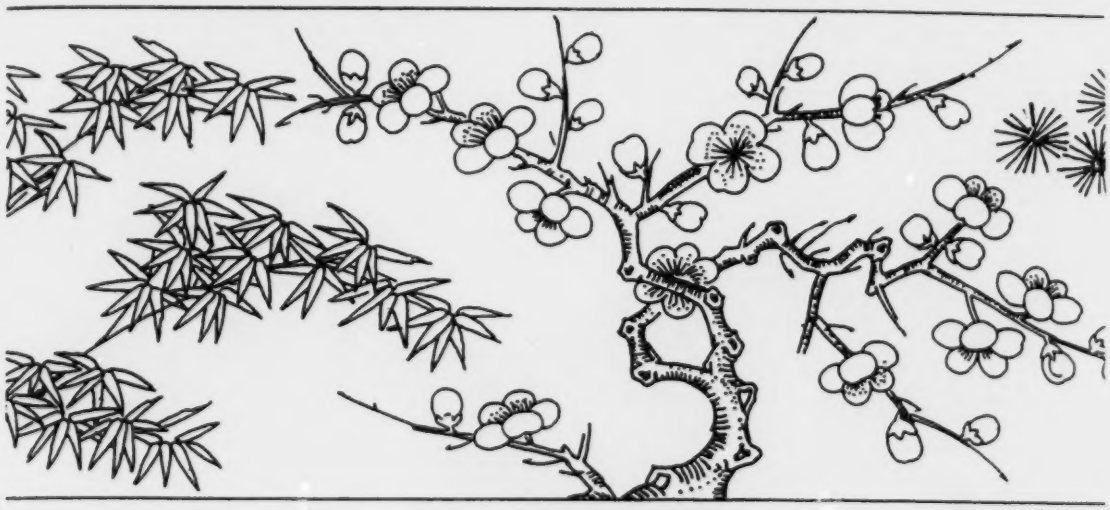
Audiovisual Resources

- *China's Only Child* (1984), 3/4" U-matic video cassette, 50 min. *Originally broadcast in the United States on the PBS "Nova" series, describes the controversial one-child family policy in the People's Republic of China.*
- *China: Sichuan Province* (1988), VHS, 25 min., National Geographic Society Educational Services. *Explore the region's geography, examine agriculture in Sichuan, and study China's rapidly developing industrial sector.*
- *The Chinese Way of Life* (1986), 24 min., VHS, AIMS Media. *This video about the People's Republic of China offers insights into an ancient culture blending into a modern world.*
- *City of Joy* (1992), VHS, 134 min., Columbia TriStar, available at local video rental stores. *A family leaves their rural Indian village and goes to Calcutta in search of a better life; instead they find the urban realities of poverty, deprivation, and corruption.*
- *Gandhi* (1982), VHS, 187 min., RCA Columbia, available at local video rental stores. *A profile of Mahatma Gandhi, the leader of India's nonviolent independence movement.*
- *Heart of the Dragon* (1984), 12-part series—each video, 57 min., Ambrose Video Publishing, Inc. *An extensive documentary on China—features unprecedented access to daily life and customs of the Chinese. The 12 topics covered are: Remembering, Caring, Eating, Believing, Correcting, Working, Living, Marrying, Understanding, Mediating, Creating, Trading.*
- *Man-Eaters of India* (1987), VHS, 80 min., National Geographic Society Educational Services. *A remarkable tribute to the tiger and to a man who saved them from extinction. Also features creation of the first tiger reserve.*
- *No Drinking Water* (1988), 25 min., Center for Development of Instructional Technology. *This film argues that India's water shortages are due to inequitable sharing of water resources.*
- *Save the Panda* (1983), VHS, 59 min., National Geographic Society Educational Services. *Scientists track the panda through nearly impenetrable bamboo forests in central China as they try to learn more about these creatures.*
- *Silent Valley: An Indian Rainforest* (1991), 50 min., Eco Media Private, Ltd. *An exploration of the complex causes of degradation affecting rainforests worldwide.*
- *Trees For Tomorrow*, 20 min., Electronics Trade and Technology Development Corporation, Ltd. *A reforestation campaign started in Harikole, India, has helped the local environment and generated income for the village.*
- *The Weeping Rice Bowl* (1992), 30 min., C-DIT Chiranjali Studio Complex. *For farmers in Kuttanad, India, the benefits promised during the Green Revolution were largely short-lived.*

See p. A-1 for addresses of video distributors.



1. Study Endangered Species

India and China are rich in biodiversity, but many of their unique species are threatened. The panda is probably the most well known, but other species students might study are the tiger, the Asiatic lion, the Indian rhino, the Nilgiri tahr, the lion-tailed macaque, the snub-nosed langur, the Beiji dolphin and Indus dolphin, the mugger, the Chinese alligator, the Indian python, and the Siberian crane. What threatens these species? (For example, tigers are killed by poachers who sell their bones and other parts for medicine.) What is being done to try to protect these species and their habitats? Are there any ways that students can support these efforts by giving money or time. Students may be interested in becoming zoo volunteers. Or, they could contacting the World Wildlife Fund, 1250 24th Street, N.W., Washington, D.C. 20037, (202) 293-4800; or Wildlife Conservation International, New York Zoological Society, Bronx Park, Bronx, New York 10460, (212) 220-6891 for general information. Or, the International Crane Foundation, E11376 Shady Lane Road, Baraboo, West Indies 53913-9778, (608) 356-9462, which is trying to save the Siberian Cranes from extinction. A useful general source is *The Grolier World Encyclopedia of Endangered Species: Asia* 2. An interesting source on the giant panda is *The Last Panda* by George B. Schaller (The University of Chicago Press, Chicago, 1993).

Skills emphasis: *Geo III 8, V 16, VI 17, 18; Hist IV 4, 5; Science III 1, 2, 4, VII 2, 3*

Suggested for use in: *Biology, Ecology, Environmental Issues*

2. View the Film, *City of Joy*

City of Joy, available in video stores, is set in Calcutta. Teachers should preview the film before assigning to determine its appropriateness for students. The film is more than two hours long (134 minutes), so it may be more convenient for students to see it outside of class. The film tells the story of a family who moves from the countryside to Calcutta. In their struggle to find a home and a way to survive in the city, they meet a young American doctor and a British nurse who run a free clinic. Point out to students that the film portrays only a narrow segment of Indian life. After students see the film, as a basis for discussion, have students do some kind of written response to the film, either choosing the topic and the form of their response, or answering one of the following questions:

- If you could visit the family, what would you like to talk to them about?
- What scene in the film impressed you the most? Why?
- What kinds of problems does the family encounter in migrating from a rural to an urban area?
- What words would you choose to characterize the film? The people shown in the film?
- What aspects of Indian life would you like to know more about?
- What does the film show about the environment in India?

Skills emphasis: *Geo II 4–6, IV 9, 10, 12, V 14–16; Hist IV 1, 4, 5; Science III 4, VII 1, 2, 3, 5*

Suggested for use in: *History, Geography, English*

3. Go Beyond the Headlines

Have students search newspapers and magazines and clip articles and pictures of the latest events and developments in China or India. Ask students to notice in particular whether there are a preponderance of stories about disasters or the negative aspects of these countries (floods, famines, riots, political upheaval, etc.). This may also be true of your own local and national coverage. Ask each student to do a brief oral report, presenting an article and providing any necessary background information needed to understand the article. Or create a bulletin board, dividing the articles up into sections according to whether they deal with population, agriculture, energy, biodiversity, etc. After studying current events, students might enjoy predicting what might happen in the future. Have them write a brief article about China or India that might appear in a newspaper in the year 2025. Make copies of the articles or have students read them aloud and discuss whether the predictions are reasonable or not.

Skills emphasis: *Geo I 1, IV 9, 10, 12, 13, VI 17, 18; Civics V 2, 3; Hist I 1, IV 1, 4, 5; Science III 4, VII 1–6*

Suggested for use in: *History, Geography, Political Science, Economics, Environmental Issues*

4. Investigate Travel Opportunities

Students who become interested in India and/or China might like to research opportunities for traveling to these countries in the future. Even if students can not expect to visit China or India, they can go through the steps of planning a trip to inves-

tigate details such as overall costs, means of transportation, visas and immunizations required, points of interest, etc.

A good source of travel information is the Council on International Educational Exchange (CIEE), a nonprofit educational organization that promotes international education and student travel (205 East 42nd St., New York, NY 10017; (212) 661-1414). CIEE publishes a book called *Smart Vacations: The Travelers Guide to Learning Adventures Abroad*, Priscilla Tovey, ed., (St. Martin's Press, New York, 1993), which is full of information about study tours, language study, and voluntary service opportunities. They sponsor a 5-week summer language and area studies program in China for high school students. Information is also available from the Canadian University Travel Service of the Canadian Federation of Students-Services (243 College St., 5th Floor, Toronto, Canada M5T 2Y1; (416) 977-3703).

A good source of information about combining travel and volunteering is Bill McMillon's *Volunteer Vacations* (Chicago Review Press, Chicago, 1993). Among the opportunities described are one at the Joint Assistance Centre (H-65, South Extn.-1, New Delhi, 110 049) and a program in which college students teach English at a summer camp in Shanghai, sponsored by WorldTeach, Harvard Institute for International Development, One Eliot St., Cambridge, MA 02138, (617) 495-5527.

The Collegiate Consortium for International Studies (2000 P Street N.W., Suite 503, Washington, D.C. 20036; (202) 223-0330; fax (202) 223-0999) arranges professional development seminars for college and university educators including study trips to India.

Skills emphasis: *Geo I 1–3; Civics V 3; Hist. IV 1; Science III 4*

Suggested for use in: *any subject*

5. Look at the Electric Lifestyle

In contrast to India and China, the American and Canadian lifestyle depends on energy consumption—for lighting, heating, cooking, recreation, and other household activities. Have students list all the electrical appliances in their home. Discuss both the number and variety of appliances, as well as their various uses: for cooking, cleaning, entertainment, washing, drying, storing food, maintaining the yard, personal grooming, etc. Are there any appliances that they seldom or never use? Have students ever experienced an extended power blackout? What was it like to live without electricity? Which appliances do students consider necessities? Which could they do without? Can they suggest alternatives to the electric appliances they can live without? (Drying hair with a towel instead of a hair dryer; washing dishes by hand; using a broom and dust pan instead of a vacuum cleaner.)

Skills emphasis: *Science VII 1, 2, 3, 6*

Suggested for use in: *Environmental Studies, Home Economics*

6. Trace a River

Two rivers, the Ganges in India and the Yellow River in China, are central to their country's history and culture. Have students research these rivers, locating them on a map and collecting information on the different regions through which the rivers flow. Where are major cities located? How have the rivers been used—and abused—by humans? How important are the rivers in the economic and cultural life of the people? One good source is Kevin Sinclair's *The Yellow River* (Knapp Press, Los Angeles, CA, 1987). Information on a project to clean up pollution in the Ganges is given in *World Resources 1994–95*, p. 94. The Global Rivers Environmental Education Network, known as GREEN (721 East Huron Street, Ann Arbor, MI 48104 (313) 761-8142), has collected data on the Ganges River.

Skills emphasis: *Geo I 1–3, IV 9, 11–13, V 14–16, VI 17, 18; Hist IV 4, 5; Science VII 1–6*

Suggested for use in: *Geography, History, Environmental Issues*

7. Sample Chinese Cooking

The Chinese have had a grain-based diet for many centuries. Rice is popular in the southern regions while noodles and steamed breads are favored in the north. Each meal typically includes rice, noodles, or steamed bread, and vegetables, or small amounts of meat, cut in bite-sized pieces suitable for eating with chopsticks. This style of eating is an essential part of Chinese culture. Have students refer back to the Food and Agriculture section of the lesson plan to how this type of diet is reflected in the country's grain production and the percentage of grain fed to livestock.

Chinese food has become so popular in the United States that supermarkets now stock the ingredients (vegetables, sauces, etc.), as well as pre-

pared versions in the deli department and frozen food sections. Chinese restaurants and carryout shops are a common sight in small towns as well as cities and suburbs.

Students could prepare a meal featuring different kinds of dishes, choosing from the various regional cuisines such as Cantonese, Szechuan, and Shanghai cooking. Your public library is a good source of books to help students learn about the various ingredients and cooking techniques. Or, invite an "expert" chef in to demonstrate food preparation.

The video series, *Heart of the Dragon*, has a 57-minute segment on food in China. Students can use material such as this to investigate how the Chinese diet differs from the one that students are used to—in types of foods, in cooking techniques and preparation time, and in impact on the environment.

A study of the diet and health of thousands of Chinese villagers provides evidence that this vegetarian diet, containing 10–15 percent of calories from fat, is the healthiest diet for humans. (Alan Durning, "Asking How Much Is Enough," in *State of the World 1991.*) Yet, some studies have shown that "American" Chinese food contains much more fat and is less healthy than the Chinese version. For more information, contact the Center for Science in the Public Interest, 1875 Connecticut Avenue, N.W., Suite 300, Washington, D.C. 20009, (202) 332-9110 for a reprint of "The Chinese Food Study," *Nutrition Action Health Letter*, September 1993.

Skills emphasis: *Geo I 1, IV 10, V 14–16; Hist. I 1, IV 1, 4, 5; Science VII 2, 3, 5*

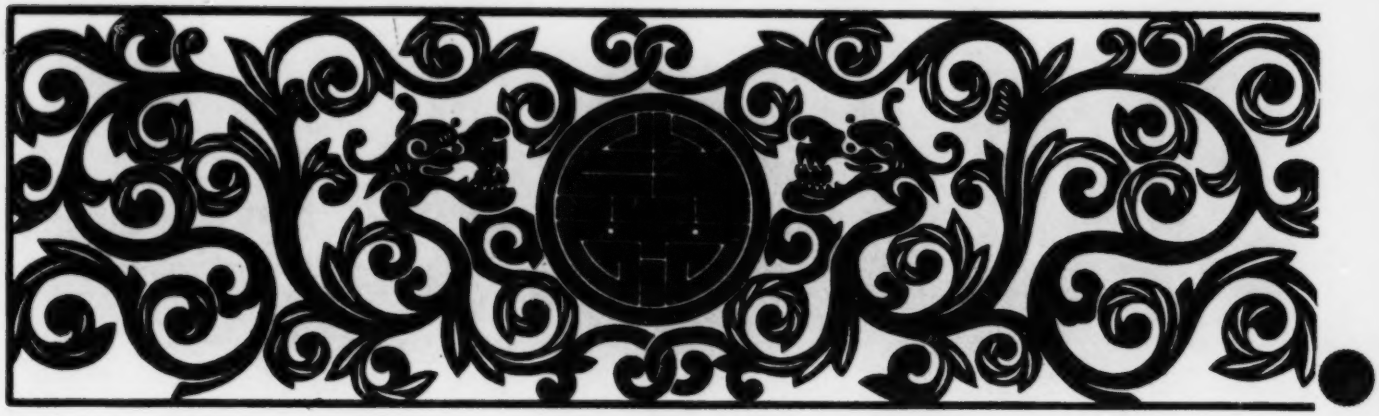
Suggested for use in: *Social Studies, Home Economics, Geography, Environmental Education*

8. Investigate Indian Cooking

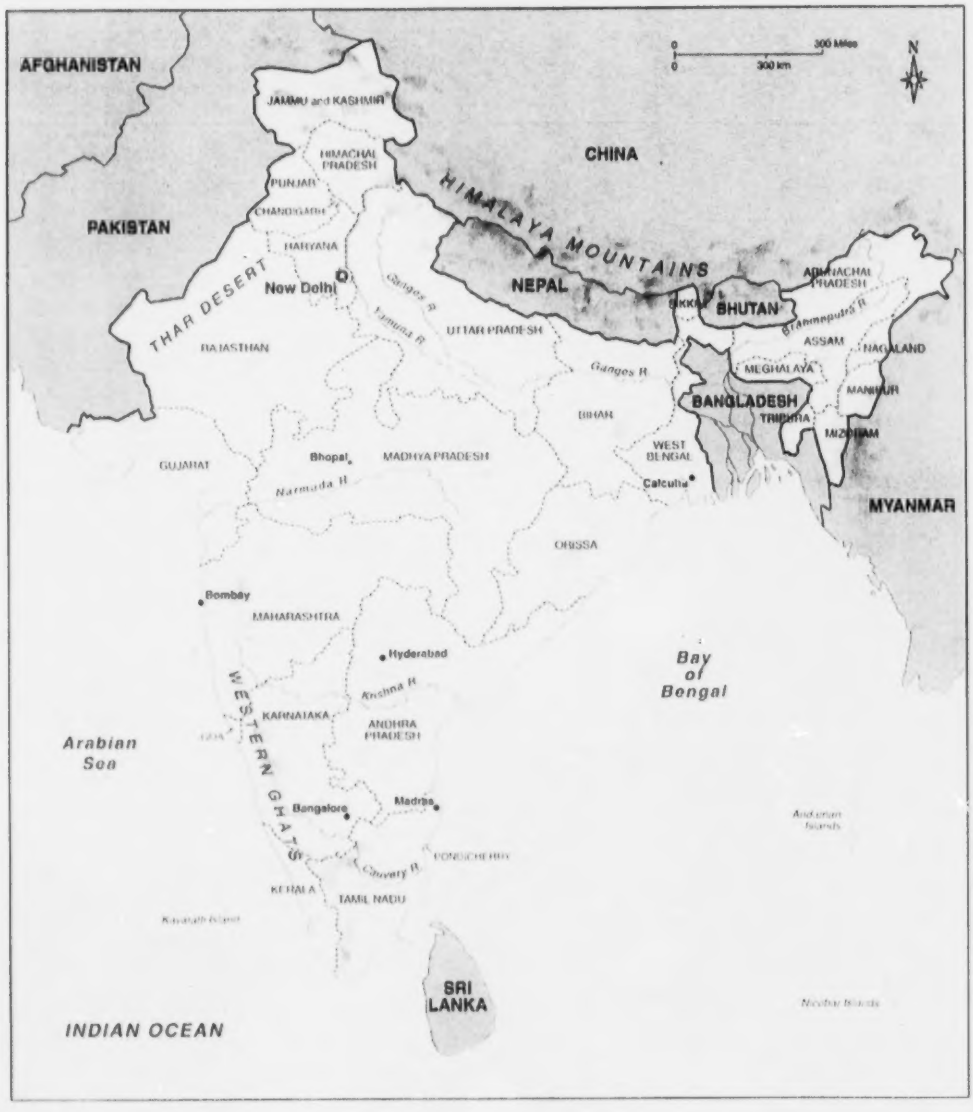
Because students are less likely to be familiar with Indian food than Chinese food, it might be interesting for them to learn about characteristic foods and to compare Indian and Chinese food. Rice and wheat are staple foods in both countries, but more than one hundred spices are used in Indian cooking, according to Sharon Kaur in *Food in India* (Rourke Publications, Vero Beach, Fla., 1989) and around 60 different kinds of pulses (lentils, chick peas, soy beans). An excellent source on Indian cooking is *An Invitation to Indian Cooking* by Madhur Jaffrey (Alfred Knopf, New York, 1973). Questions to investigate include: How and why does the type of food vary from one region to another? How are people's eating habits affected by caste and by religious beliefs? What are some special foods served at festivals? How is food usually prepared, served, and eaten? Have students prepare a meal featuring a variety of Indian dishes, if possible, under the guidance of someone who is familiar with Indian cooking.

Skills emphasis: *Geo I 1, IV 10, 12, V 12–16; Hist. I 1, IV 1, 4, 5; Science VII 2, 3, 5*

Suggested for use in: *Social Studies, Home Economics, Geography, Environmental Education*



What's It Like in India?



Facts and Figures

Official name: The Republic of India

Capital: New Delhi

Government: federal republic, parliamentary system

Head of Government: Prime Minister P.V. Narasimha Rao

Estimated population, mid-1994: 911 million

Population, 1990: 846 million

Population growth rate, average 1990–95: 1.9 percent

Land Area: 734 million acres (297 million hectares)

Chief crops: rice, grains, coffee, sugar cane, spices, tea, cashews, cotton, copra, coir, juta, linseed

Industries: Textiles, food processing, steel, machinery, transportation equipment, cement, jute, mining, petroleum, power, chemicals, pharmaceuticals, and electronics

Minerals: chromium, coal, iron, manganese, mica, salt, bauxite, gypsum, oil

Climate: varies from tropical monsoon in the south to temperate in the north

Environmental problems: droughts, floods, severe thunderstorms; deforestation; soil erosion; overgrazing; air and water pollution; desertification

Languages: Hindi, English, and 14 other official languages

Religions: Hindu (83 percent), Muslim (11 percent), Other (including Sikh, Jain, and Christian, 6 percent)

Literacy rate: 48 percent (men, 62 percent; women, 34 percent)

Gross national product per capita: US$330

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Physical Environment

- India is roughly one-third the size of the United States. However, its population is well over three times that of the United States.
- In northern India, the Himalayas, the highest mountains on Earth, separate India and Nepal from China. In contrast, the northern plain is generally flat from the Arabian Sea on the west to the Bay of Bengal on the east. The floodplains of the Ganges, the Indus, and the Brahmaputra rivers are rich and fertile. South of the northern plains, the land rises up into the Deccan Plateau, between Pakistan on the west and Bangladesh on the east.
- India has three seasons: the hot season (March to May), the wet season (June to September), and the cool season (October to February). Temperatures can fall to 40°F (4°C) in winter and reach 10°F (38°C) in summer. During the hot season, the country becomes dry and barren so that when the monsoon arrives, it is a welcome relief. The southwest monsoon is the source of about three quarters of India's annual rainfall. Because few farmers can afford irrigation systems, a successful monsoon is central to the farming economy of India.

Government

- India has a federal parliamentary system of government with a lower house, the Lok Sabha (House of the People), and an upper house, the Rajya Sabha (the Council of States).
- Its executive branch has a president, vice-president, prime minister, and a Council of Ministers. It also has a judicial branch with a Supreme Court.
- India is divided into 26 states and 6 union territories.

Economy

- India's economy is a combination of capitalist entrepreneurship and socialist government controls.
- In spite of increasing industrial development, India remains primarily an agricultural nation. The majority of the labor force—about 60 percent—is employed in agriculture.
- India has important iron and steel works and a growing manufacturing industry. Textiles are a principal domestic product and a profitable export.
- The currency is the Indian rupee. As of mid-1994, about 30 rupees equal US$1.

People

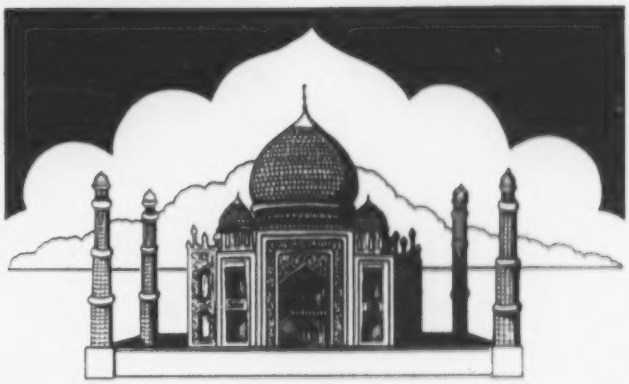
- India has the second largest population in the world after China. The population of India represents 16 percent of the world's total. However, India possesses only 2.3 percent of the world's land resources and 1.7 percent of the world's forest stock to support this population.
- Poverty is a serious problem in India, where an estimated 30–40 percent of the population live in poverty. Four out of five of India's poor live in rural areas.
- India is one of the most ethnically diverse countries in the world, with religion and language separating people more than ethnic background. About 83 percent of the people are Hindu. There are about 76 million Muslims, making India one of the largest Muslim countries in the world. There are also 19 million Christians, 13 million Sikhs, 5 million Buddhists, and 3 million Jains.
- India's caste system, although constitutionally abolished, still limits social mobility. The caste system has four broad divisions, called the *varna*, based primarily on vocation. Each has its own rules of conduct and behavior. At the top is the Brahmin class, who were traditionally priests and scholars; next come the Kshatriyas, who were warriors and rulers; the Vaisyas are the artisan and commercial class; and, finally, the Sudras are the farmers and the peasant class. Beneath these four castes is a fifth group, the untouchables, who perform the most menial and degrading jobs. Each major *varna* has several castes and subcastes, again primarily based on specific occupations and organized hierarchically. The caste system applies only to Hindus; the Sikhs, Muslims, and Christians do not have caste. While the caste system still exists, it does so in a much more diluted form and the boundaries are much more fluid.
- Besides Hindi and English, there are 14 other official languages. At least 30 percent of the population speaks Hindi. There are at least 300 known languages in India, 24 of which have 1 million or more speakers each. Most Indians speak more than one language.

Religion and Philosophy

- Hinduism is one of the world's great religions and an important social force in India. It recognizes a trinity of principal gods: Brahma, the creator; Vishnu, the preserver, and Shiva, the

destroyer. Hindus believe that Vishnu periodically visits the world to destroy evil and preserve truth. His most widely known incarnations are as Rama (the hero of the epic tale the *Ramayana)* and Krishna. Many of his incarnations have also been as animals. The Hindu code for living is based on *dharma*, doing one's duty. *Karma* is the belief that present actions affect future existence; the soul is thought to be eternal and to go through a cycle of births, deaths, and rebirths in both animal and human form. Hindu philosophy also contains the concept of *nirvana*, or oneness with God—a state that one works toward to escape the cycle of rebirth. This can be achieved by leading an exemplary life.

- Islam came to India with the Muslim invaders. Muslims believe in one god: Allah. Their holy book is the Koran and their most noted prophet is Mohammed. Muslims pray several times a day and attempt to make a pilgrimage to Mecca at least once in their lives. They fast during the day in the holy month of Ramadan. The religion stresses charitable acts and a simple lifestyle.



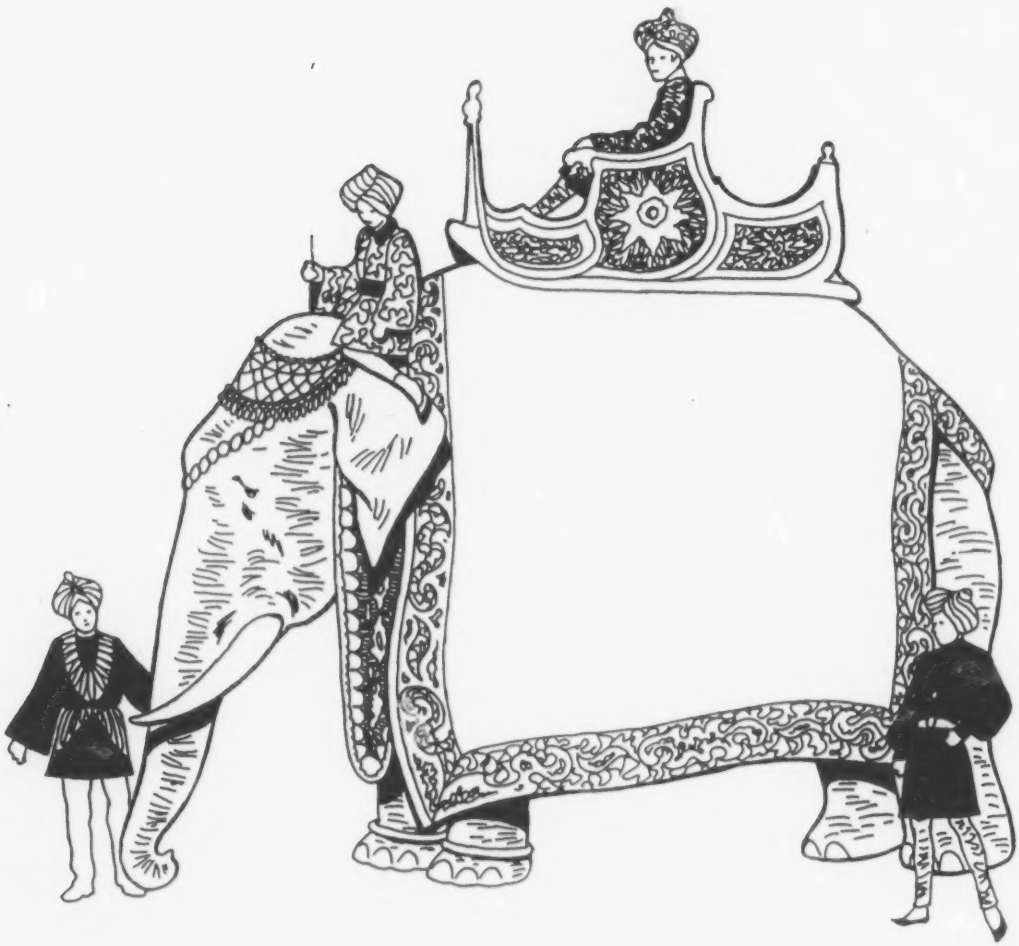
History

- The Indus civilization dates back to 2500 B.C. The Indus people built carefully planned cities and had a written script. In about 1000 B.C., they were conquered by the Aryans, nomads from central Asia, and for the next 2,000 years, their civilization developed in kingdoms of various sizes—the most noted of which was the Mauryan empire under Ashoka, one of the great kings of world history. Ashoka, who lived around 200 B.C., abandoned warfare for a creed of peace, tolerance, and prosperity. He practiced the code of *ahimsa*, or nonviolence toward all living things, a code called to the attention of the world again several thousand years later by Mahatma Gandhi.
- Around 1200 A.D., Muslims began penetrating northern India and establishing separate kingdoms, which often warred with the Hindu kingdoms.
- In 1523 A.D., India was invaded by Babur the Mogul. Babur, a descendant of the Mongol warlord Genghis Khan, proclaimed himself the Emperor of India and began the new age of the Great Moguls, which lasted almost until 1800. This was a time of trade, creativity, and economic expansion. Many of India's great buildings—the Taj Mahal and many elaborate mosques, palaces, and forts—were erected during this period.
- Mogul power was in decline as European traders began establishing trading ports in Bombay, Madras, and Bengal. The British ruled India as a colony from the early 1800s to 1947. They modernized India and built an extensive network of railways and communication systems, but also exploited India's natural resources and discouraged industrial development. Indian intellectuals resisted British rule for many years, and there were sporadic demonstrations, which at least once resulted in a massacre by government forces.
- In the 1930s, the Indian National Congress, with Mahatma Gandhi as its leader, pushed for independence. Using the principles of *ahimsa*, non-violent resistance, Gandhi organized thousands of Indians to peacefully press for the right to govern their own country.
- One of Gandhi's greatest disappointments was that he was not able to eliminate violence between Hindus and Muslims. When India was granted independence in 1947, the British created the separate state of Pakistan as a homeland for Muslims. During a bitter and massive migration, 5 million Hindus migrated from Pakistan to India and 5 million Muslims traveled from India to Pakistan. Gandhi was murdered in 1948 by Hindus opposed to his conciliatory approach to Muslims.

Reprinted from *The Quintessence of Gandhi in His Own Words.*

- The republic of India was established in 1950, and it has had a tumultuous history as the world's largest democracy. The great diversity of religions, cultures, ethnic groups, and languages has continued to produce clashes—often including acts of terrorism and assassinations. Two prime ministers were assassinated: Indira Gandhi (who had succeeded her father, Jawaharlal Nehru, India's first prime minister) and Rajiv Gandhi (her son). In 1970, East Pakistan, with the support of India, waged a brief war to break away from West Pakistan and the country of Bangladesh was established.

Sources: *The Economist* Intelligence Unit, *India, Nepal: Country Profile 1990–91* (*The Economist* Intelligence Unit, London, 1990); United States Central Intelligence Agency, *The World Factbook 1992* (United States Government Printing Office, Washington, D.C., 1992); Watson, Francis, *India: A Concise History* (Thames & Hudson, New York, 1974); and World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, *World Resources 1994–95* (Oxford University Press, New York, 1994).



What's It Like in China?

Facts and Figures

Official name: The People's Republic of China

Capital: Beijing

Government: Communist Party-led state

Head of Government: Deng Xiaoping

Estimated population, mid-1994: 1.19 billion

Population, 1990: 1.15 billion

Population growth rate, average 1990–95: 1.4 percent

Land area: 2.3 billion acres (932 million hectares)

Chief crops: rice, potatoes, sorghum, peanuts, tea, millet, barley, pork

Industries: iron, steel, coal, machine building, armaments, textiles, petroleum, cement, chemical fertilizers, consumer durables, food processing

Minerals: coal, iron ore, tin, tungsten, antimony, manganese, molybdenum, lead

Climate: wide ranging, from tropical in the south to subarctic in the north to desert in the west

Environmental problems: frequent typhoons, damaging floods; tsunamis; earthquakes; deforestation; soil erosion; industrial pollution; water and air pollution; desertification

Languages: standard Chinese (Putonghua) or Mandarin; also other minority languages and dialects

Religions: officially atheist, but elements of Buddhism and philosophies such as Confucianism and Taoism provide a strong code of conduct

Literacy rate: 73 percent (male, 84 percent; female, 62 percent)

Gross national product per capita: US$364

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Physical Environment

- The People's Republic of China is the third largest country in the world in terms of land area (after Russia and Canada), accounting for 7 percent of the world's total.
- Two thirds of China is mountainous or semi-desert; only about one tenth is cultivated. Most of China's population resides in the eastern half of the country in the fertile plains and valleys of the major river systems: the Yellow River (the Huang), the Yangtze River (the Changjiang), and the Pearl River (the Zhujiang). Western China accounts for more than half of the country's geographical area, but only 5 percent of its population.
- Some of the world's longest rivers are in China. The Yangtze River is 3,900 miles (6,300 kilometers) long.
- While summers are warmer and winters colder, China's climate is much like that in the United States. Summers are hot and humid, with frequent heavy rains that cause flooding. Winters are dry and rather cold. The climate is also affected by monsoons.

Government

- The People's Republic of China is a socialist state led by the Communist Party of China. National policy is determined by a 20-member Politburo and a seven-member Standing Committee. The National People's Congress is the country's legislative body; it has more than 2,000 members.
- The country is made up of 23 provinces, 5 autonomous regions, and 3 special municipalities.

Economy

- In spite of its scarcity of arable land, China is primarily an agricultural nation. About 67 percent of the population is employed in agriculture.
- Since 1978, China has moved the economy from the Soviet-style centrally planned economy to a more productive, flexible economy, but still within the framework of Communist control. There is now a wide variety of small-scale enterprise, more household responsibility for farming, instead of the old collective concept, and increased foreign trade and participation in joint ventures with the foreign economic sector.
- China is currently experiencing an economic boom. The country's growth averaged nearly 10 percent from 1978 to 1988, but has risen to nearly 13 percent in 1992 and 1993.
- The currency is called the *renminbi* (RMB), and the standard unit is the *yuan*. As of mid-1994, about 8 renminbi equal US$1.

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People

- China's population is the largest in the world.
- To reduce the 1.4 percent annual population growth rate, the government sponsors family-planning programs and offers incentives that include money, housing, and educational advantages to families who have only one child. While the policy has come to be accepted in urban areas, it conflicts with traditional social mores and beliefs that are still strongly held in rural areas. Less than 10 percent of all families have more than two children.
- Standard Chinese (Putonghua), based on the Mandarin dialect, is the national language and is spoken by over 70 percent of the population. Other dialects, including Wu, Min, Yue, and Kejia, are also spoken. China's written language (Baihua) is the same for all dialects.

Religion and Philosophy

- Confucianism, Taoism, and Buddhism are ancient philosophies or religions that have shaped the Chinese way of thinking for centuries. Confucianism is a code of ethics and social conduct developed by Confucius that has been an important social force for more than 2,000 years; Confucianism emphasizes proper conduct and a respect for authority. Taoism was begun by Lao Tzu who was a contemporary of Confucius. Unlike the practical Confucianism, Taoism stresses the mystical side of human nature and encourages the search for inner peace. Buddhism began with Guatama Buddha who lived in India from 563–483 B.C.; it was introduced to China in the first century A.D. The most popular form of Buddhism in China was "Chan," which later evolved into Zen Buddhism in Japan. It emphasized meditation as a way of finding the original pure nature of the self.

- Ancestor worship is a strong tradition in China. It assumes that honoring dead ancestors will bring good fortune and protection from evil forces.

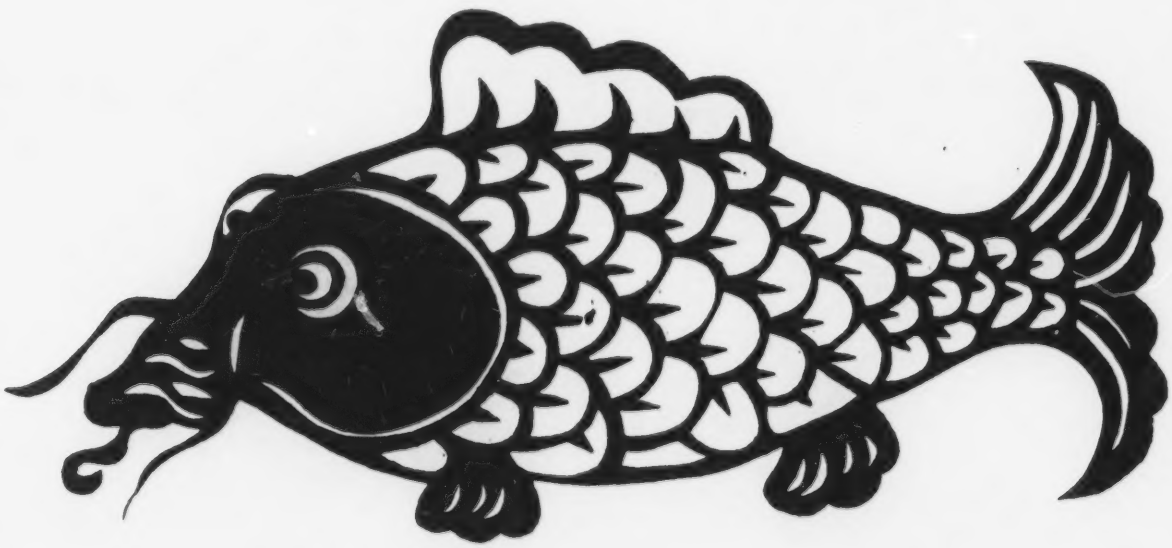
History

- China is one of the world's oldest continuous civilizations, with written historical records that date back nearly 3,500 years.
- The ancient sacred book, the *I Ching*, which predates recorded history, sets forth the view that the world is subject to the alternating forces of *yin* and *yang* (variously interpreted as dark and light, female and male, etc.) that cycle through history.
- By 2000 B.C., China had an urban civilization with an elaborate class system, metal work, and art. A series of dynasties came and went, often with some bloodshed.
- The most notable Chinese dynasties were the Han (206 B.C. to 220 A.D.), the Tang (618 A.D. to 907 A.D.) and the Sung (960 to 1280). Under them, China prospered economically and enjoyed significant achievement in literature, art, and music.
- In the 13th Century, Genghis Khan invaded China. Kublai Khan, the grandson of Genghis Khan, became Emperor of China in 1279. Another descendent of Kublai Khan, Babur the Mogul, conquered India and became emperor of that country in the 14th Century.
- The Mongols were eventually driven out and the prosperous Chinese Ming Dynasty established (1368 to 1644). However, within a century, China was again invaded—this time by the Manchus, who ruled for 250 years.
- The Great Wall of China is actually a combination of many walls built during ancient times to keep out northern invaders. The Wall's present form dates from the Ming dynasty. It is 1,500 miles (2,400 kilometers) long and winds across northern China from the Gansu Province to the Habei Province on the Yellow Sea.
- In 1911, as the Qing Dynasty was collapsing, Sun Yatsen was proclaimed first provisional president. Later, in 1912, after the Manchus re-

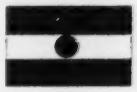
nounced the throne, China was declared a republic.

- In the early 1920s, the Chinese Communist Party was founded in Shanghai with Mao Zedong as one of its founding members. Mao led the party until his death in 1976.
- During the two world wars, China struggled against Japanese invasion while simultaneously facing an internal political struggle between president Chiang Kaishek's forces and the Chinese Communists.
- In 1949, the Communists, led by Mao, won a civil war, drove Chiang Kaishek's supporters to Taiwan, and established the People's Republic of China. Today, Taiwan is known as the Republic of China, but the People's Republic of China still considers it a province.
- In the past 40 years, China has seen numerous political upheavals under Communist rule as well as natural disasters, including earthquakes, floods, and droughts. The Communist government did redistribute income, slow population growth, improve agricultural production, and force industrialization, but there was also widespread deprivation including a famine that may have killed as many as 40 million. China closed itself off from Western countries until the 1970s.
- Since 1978, China has shown a great interest in decentralizing its economy to allow for entrepreneurial economic growth; international companies are showing a great interest in China as a good market and area for investment.

Sources: United States Department of State Bureau of Public Affairs, *Background Notes: China* (United States Government Printing Office, Washington, D.C., 1987); *The Economist* Intelligence Unit, *China, North Korea: Country Profile 1990–91* (*The Economist* Intelligence Unit, London, 1990); Lei, Xiong, "China's War on Waste and Pollution," *People and the Planet*, Vol. 2, No. 2, 1993, p. 19–21; United States Central Intelligence Agency, *The World Factbook 1992* (United States Government Printing Office, Washington, D.C., 1992); Fairbank, John King, *China: A New History* (The Belknap Press of Harvard University Press, Cambridge, Mass., 1992); and World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, *World Resources 1994–95* (Oxford University Press, New York, 1994).



India's Population Future



As of mid-1994, one out of every six people in the world lives in India. India's population, 911 million, is the second largest in the world. By contrast, the United States, with the third largest population, accounts for only one of every 20 people.

India's population is not only large but growing—at the rate of 1.9 percent per year. This rate of growth means that India's population could reach 1 billion by the turn of the century and 1.4 billion by 2025. Soon afterwards, it could overtake China and become the most populous nation on Earth.

An Indian woman has an average of 3.6 children in her lifetime, which is significantly more than replacement-level fertility (slightly more than two children). Thus, Indian births far outnumber deaths, and the population increases. However, the fertility rates vary widely from one region of India to another. The southern state of Kerala has the lowest fertility rate—two children—while in the northern states of Bihar and Uttar Pradesh, the average number of births per women is nearly six.

Bihar, Uttar Pradesh, and the four other northern states with the highest fertility rates are the poorest states, with the lowest per capita income and the highest percentage of the population below the poverty line. These six states also rank at the bottom in child mortality, female literacy, and average age of females at marriage.

Factors Affecting Fertility Rates

A number of factors affect fertility rates. One is the availability and acceptability of contraceptives and health services for women and children. Another is a cultural preference for sons. In northern India, sons are desired because they contribute income to the family and care for their parents in old age. Sons inherit the family property. Parents must provide dowries for daughters, who become a member of their husband's family when they marry. In the southern state of Kerala, the social status of women is much higher, and women possess significant economic rights. For example, among the Nairs, a tribal group, property is traditionally inherited by daughters.

The educational status of women also has a significant effect on fertility. Kerala has the highest literacy rate in India and the lowest fertility rate. According to World Bank studies, for every year of schooling a woman receives, her fertility rate is reduced by 10 percent.

Kerala also has the lowest infant mortality rate in India. As a rule, where infant mortality rates are high, parents have more children because they can't be sure their children will survive.

Impact of Population Growth

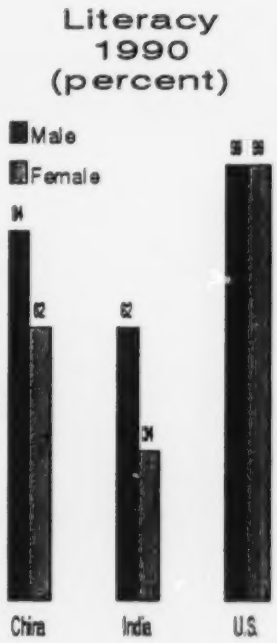
Rapid population growth creates many pressures. In the last 40 years, India's ecological systems have been severely taxed as the population has more than doubled, increasing consumption of resources. Poverty is a serious problem, and roughly four out of five of India's poor live in rural areas. Many of these have migrated in search of economic opportunity. When they move to urban areas, pollution levels rise, and it is difficult for cities to provide jobs, education, sanitation, and health services to ever-larger populations. When people migrate to wilderness areas, wildlife habitat is degraded or destroyed.

Population Policy

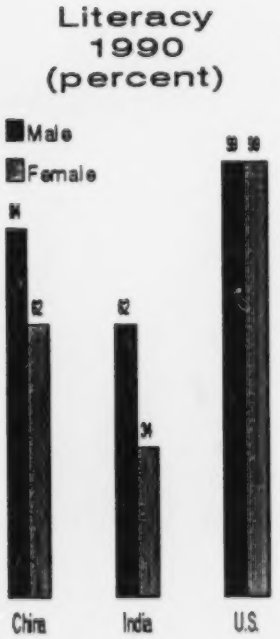
India was one of the first nations to recognize the implications of rapid population growth for future development. In 1959, it announced an official policy to lower the birth rate. After 40 years, an extensive network of clinics is in place around the country, providing contraceptive and maternal and child health care services. As family planning has become more socially acceptable, birthrates have fallen, but not enough to stop significant population growth.

New studies suggest that truly effective population programs should expand not only contraceptive access but economic opportunity, access to health care, and education levels. These factors are especially important for women, whose literacy levels in India are only about half those of men.

Source: *World Resources 1994–95.*



China's Population Future



As of mid-1994, one out of every five people in the world lives in China. China's population, at 1.19 billion is the largest in the world. By contrast, the United States, with the third largest population, accounts for only one of every twenty people.

China's population is large and growing—at the rate of 1.4 percent per year. However, unlike other developing countries, China has succeeded in slowing its rate of growth. Its current (1994) fertility rate is at replacement level (around two children per woman) and is slightly lower than that of the United States. The Chinese government's population control measures have been so successful that by 2050, China's population should level off at 1.5 billion.

Changing Population

Meeting the needs of this vast population with China's limited natural and economic resources is an enormous challenge. The population is not only growing, it is changing.

For example, the population is aging. The number of people 65 or older is expected to reach 90 million by the year 2000 and 167 million by 2020, compared with an elderly population of 66 million in 1990. This change has many important demographic implications, because most rural elderly have no old-age pensions and must rely on adult children for support.

The population is also becoming more urban. The 1990 census estimated China's urban population at 297 million, an increase of nearly 90 million since 1982. Beijing's population increased by 17 percent and Shanghai's by 13 percent during this period. The rate of natural increase was estimated at 8 percent in Beijing and 5 percent in Shanghai; the rest of the growth was due to migration to these cities. These statistics reflect the mounting population shifts following the economic reforms of the 1980s and the decollectivization of agriculture.

Over the last 40 years, China's agriculture, cities, energy supplies, and forests have all come under increasing stress as its population has more than doubled. More people consume more resources—the need for fuelwood has lead to the destruction of forests, for example. Population pressure in rural areas encourages people to move in search of work. When they migrate to the cities, pollution levels rise and other urban problems are magnified.

Population Policy

The Chinese government has been quite successful in slowing its population growth. During the mid-1960s, a new rural health system was created with a network of more than 1 million trained paramedics and town and county health clinics that provided free family planning. These new services, coupled with heightened political pressure to limit family size, led to a dramatic halving of the fertility rate in the 1970s.

In 1979, with the introduction of its one-child-per-family policy, China's fertility rate dropped even more. This policy included financial rewards to couples who limited themselves to one child. The program was unpopular in rural areas, where the preference for sons was still strong. The policy is currently only strictly enforced in the cities.

The government has recently shifted its emphasis to elevating the status of women, providing old-age security, and improving family planning and maternal health services in its attempt to curb growth. Thirty years of efforts to improve the health and education of the Chinese people have raised life expectancy to 71 years, considerably higher than India's 60 years. Child mortality at 43 deaths per 1,000 live births, is much lower than India's 131. China's literacy rate is significantly higher than India's (see graph).

The fate of China's environment may ultimately depend on the pace of population growth and China's ability to stabilize it.

Source: *World Resources 1994–95.*

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Urban Life in India

Although three quarters of India's population live in rural areas, its urban population is the second largest in the world. Thirty years ago, only 19 percent of India's population lived in cities; today 27 percent are city dwellers. By contrast, about three quarters of Americans and Canadians live in cities (see graph).

Rapid Growth

Three of the world's largest cities in 1990 were Bombay (12 million), Calcutta (10 million), and New Delhi (8 million). These are "megacities"—cities that are expected to have a population of at least 10 million by the year 2000. Bombay will soon be larger than New York. India also has 34 cities with a population of at least 750,000 inhabitants.

Indians are migrating to the cities in search of jobs and a better life. However, in large cities, such as Calcutta, Bombay, and New Delhi, one third to one half of the population lives in slums and squatter settlements. Conditions are crowded. In India's largest cities, an average of 3 to 4 people live in each room. (Megacities in the United States average 2 rooms for every person.)

Overcrowding is also a problem for urban public transportation systems. Most people cannnot afford to own a car, and so must rely on walking, buses, or motor scooters. Between 1981 and 1989, the number of two-wheeled vehicles quadrupled.

Air Pollution

Air pollution is a serious problem in most urban areas, especially India's megacities. For megacities in general, suspended particulate matter, such as ash, soot, or dust, is the single most unhealthy air pollutant. Levels of suspended particulates in all three of India's megacities are well above the guidelines set by the World Health Organization. Industries and motor vehicle use contribute to air pollution, as does burning wood for domestic fuel. Many urban residents still cook with firewood.

Water and Sanitation

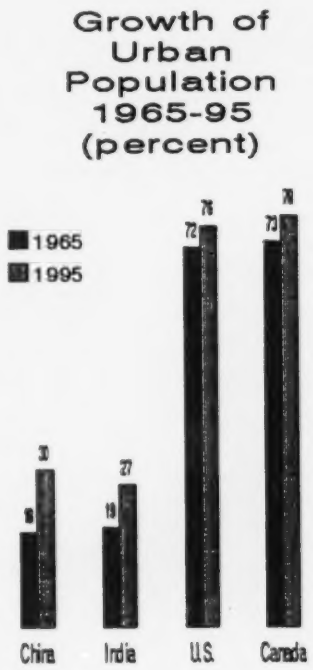
The most serious environmental problem and threat to public health in India's cities is inadequate access to clean water and sanitation. About 70 percent of India's water is seriously polluted with disease-causing organisms due to the lack of sewage treatment facilities. By early 1992, 86 percent of urban Indians had access to clean drinking water. Sanitation services were available to about 44 percent of the urban population but less than 3 percent of the rural population. Most cities have no sewage treatment facilities.

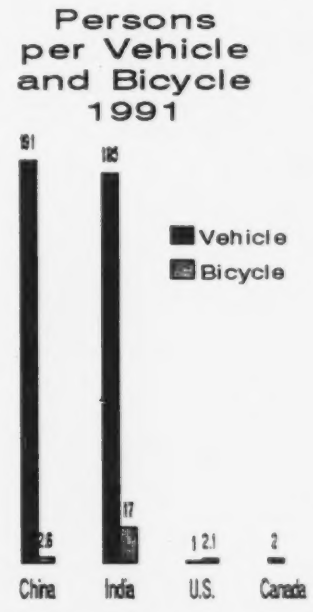
There are also problems with water shortages. Cities have grown so fast that they cannot meet the ever-increasing demand for water. Some cities, such as Madras, must limit the number of hours when water is available. There are also problems with industries releasing toxic wastes into rivers and streams.

Cleaning Up The Rivers

Plans to clean up rivers are being developed. The biggest is the plan to clean up the Ganges, or *Ganga*, as Indians called it. The Ganges is considered to be a holy river. Pilgrims come to bathe in its waters or cast the ashes of a cremated body adrift, thereby freeing the soul from the eternal cycle of death and rebirth. Cleaning up the river, which flows through 25 of India's largest towns, is an enormous task. The plan for the Ganges includes sewage treatment plants, low-cost sanitation facilities, electric crematoria and more efficient wood-based crematoria, waterfront regulation of traffic, separate sites for washing clothes, and the construction and renovation of bathing ponds. The government has also introduced into the river specially bred snapping turtles that eat partially cremated corpses but do not nip bathers.

Source: *World Resources 1994-95.*





Urban Life in China

China has 51 cities with at least 750,000 inhabitants. Of these, three are among the world's largest: Shanghai (13 million inhabitants in 1990), Beijing (10 million), and Tianjin (9 million). These are what are known as "megacities"—cities that will have a population of at least 10 million by the year 2000.

Rapid Growth

Shanghai will soon be larger than New York. During the 1950s, the cities grew so rapidly that the government imposed restrictions on moving from rural to urban areas. By 1995, about 30 percent of the population will live in cities.

Every country in the world is experiencing rapid urbanization. More than 75 percent of Americans and Canadians currently live in cities, because of large-scale migration from rural areas over the past several generations. By 2005, half of all the world's people will be urban dwellers and by 2025, it will be two out of three. Such rapid urbanization places enormous strain on developing countries to provide the infrastructure necessary to support their populations.

When people move into urban areas, they expect to find job opportunities, increased income, and better access to health services and education. Incomes and living standards in China's cities are two to three times higher than in the countryside. Many urban dwellers have secure state jobs with benefits such as housing that is built by the government. Some cities are booming as economic reforms encourage foreign investment. In Shanghai, for example, the Chinese government invests billions to build a new port, bridges and expressways, a second airport, and high-rise buildings.

Housing and Transportation

Most Chinese cities are more densely populated than North American cities. In Shanghai, for example, there are an average of two people for every room, while in New York or Los Angeles, there are two rooms for every person. While the streets of Chinese cities are very crowded, there is a much lower ratio of people to cars than in North America. China has 191 people per motor vehicle compared to 1 person per vehicle in the United States and 2 in Canada. The Chinese rely on bicycles, motor scooters, public transportation, or walking.

Polluted Air

Air pollution is a serious problem in some Chinese cities, due to China's reliance on coal. Beijing is among the worst cities in the world for air pollution.

Air pollution takes a heavy toll on human health in China. In 1988, 26 percent of all deaths in China were caused by chronic lung disease, linked to exposure to air pollution and cigarette smoking. This rate is five times higher than in the United States.

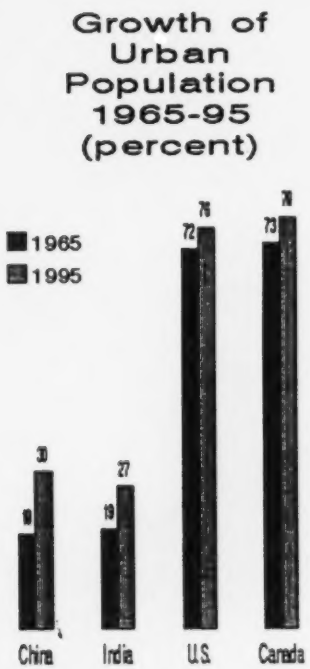
Some cities such as Benxi in China's northeast industrial area are trying to clean up their air by encouraging the use of natural gas instead of coal, and fining factories that create pollution.

Water and Sanitation

Urban drinking water is generally poor. Many of China's rivers are polluted, most severely in urban areas. About 80 percent of urban river water is polluted to some degree. Most urban dwellers have access to sanitation services, but only 19 percent of the municipal wastewater receives treatment. Safe drinking water is available to about 87 percent of urban Chinese residents; however, in rural areas, it is only two thirds.

China has developed national standards for discharge of water pollutants. Under a pollution levy system, facilities that violate these standards are fined. However, fines are low.

Source: *World Resources 1994-95.*



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Food Production and Agriculture in India

India is a nation of farmers: the majority of the labor force—60 percent—is involved in agriculture. Three quarters of the population, and four out of five of India's poor, live in rural areas. Land is privately owned and farmed by owners and hired workers. Most farms are small—76 percent are smaller than 5 acres (2 hectares)—and work is typically done by hand or with the help of draft animals.

Rice is grown in the south and east and is the basis of meals in those regions. In northern India, wheat and other cereals such as sorghum, millet, and barley are staple foods. Lentils and peas are major sources of protein. Most Indians are vegetarians, in part due to dietary rules of the various regions. India uses only 3 percent of its grain to feed its cattle and poultry, unlike the United States, which feeds 69 percent of its grain to livestock.

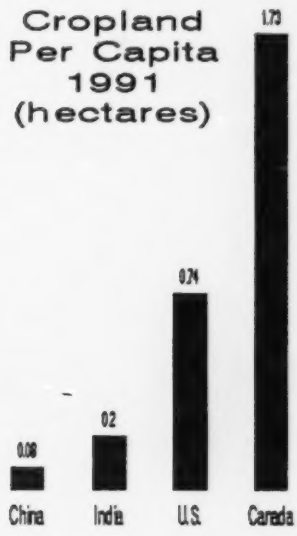
India has large numbers of livestock, which place heavy demands on grazing lands. Both grasslands and forest areas suffer as a result. India has the world's largest cattle population (193 million), large numbers of sheep and goats, and more water buffalo and camels than any other country. The Hindu religion forbids the slaughter of cows, which provide milk, dung for fuel and fertilizer, draft power for agriculture, and transportation. Other livestock also produce food and raw materials for industry (leather hides and wool).

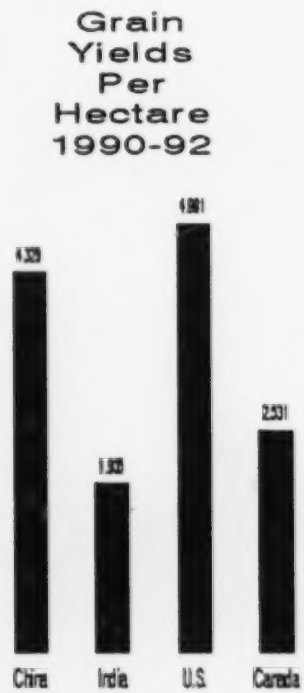
Increasing Production

Producing enough food for an increasing population is a critical development challenge for India. With nearly as much cropland as the United States, India must feed four times as many people. Roughly half of India's land is used for agriculture, far higher than the world average of 11 percent. Because not much more land is suitable for farming, India must develop productivity on existing lands.

Over the past four decades, India more than tripled food production. The development and rapid spread of high-yield varieties of wheat and rice in the mid-1960s was the key ingredient in this dramatic increase. Although 30 percent of this production growth (known as the Green Revolution) came from expanding farmland area, most of the increase—indeed, nearly all since the late 1970s—has come from increased average yields. In other words, farmers using the new varieties of grain were growing more food on the same amount of land.

Growth in milk and egg production also increased dramatically. Dairy and poultry enterprises now provide substantially higher financial returns per hectare





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than crop farming. Such enterprises create new jobs and bring about health and nutritional improvements.

Water: A Vital Resource

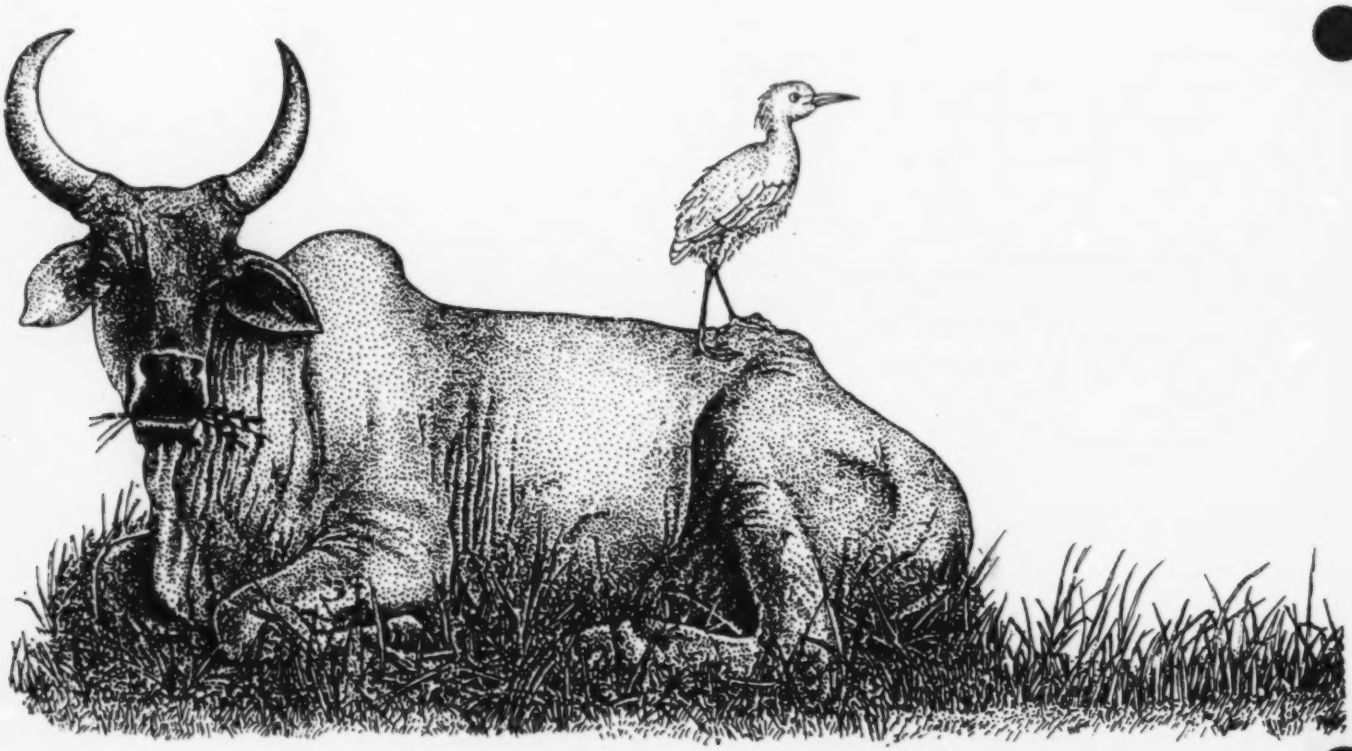
Increased use of irrigation has helped India increase average yields. About one third of the cropland in India is irrigated, but rainfed agriculture is central to the economy. Harvests—and national prosperity—have traditionally depended on a successful southwest monsoon, the source of about three fourths of India's annual rainfall. The timing and intensity of the monsoon varies from year to year. About one fourth of the cropland is prone to flooding.

While irrigation provides a reliable source of water and helps increase productivity, it may also eventually damage the soil, making it less productive. Sometimes the soil becomes salinized when water evaporates and leaves salt deposits. Sometimes irrigation leads to waterlogging of the soil. Waterlogging lowers crop yields, and hastens the loss of soil nutrients. Irrigation also leads to loss of soil nutrients (such as zinc, copper, and iron) which plants need to grow. Soil degradation seriously affects agricultural production. About 210 million acres (85 million hectares) of India's farmland are affected.

Despite its great progress in increasing agricultural production, India's average yield of cereal crops is less than half that of China and the United States (see graph). However, production must be increased without destroying the basic resources of soil and water, if it is to be sustainable.

Improved irrigation techniques have the potential to increase food production. Improved farming techniques in areas that rely on rainfall also could improve yield. Improving the use of fertilizer, especially on rainfed land, also would help production. India is trying a variety of strategies, from sophisticated water management techniques to traditional farming practices.

Source: *World Resources 1994–95*.



Reprinted from *Essential Learnings in Environmental Education*.

Food Production and Agriculture in China

To feed its large and growing population (1.19 billion people in mid-1994), China must raise productivity on existing land, since it possesses no extra arable land. While China's land area is vast—constituting 7 percent of the world's total—only about 10 percent is suitable for growing crops. The amount of cropland per person is very small, only 0.19 acres (0.08 hectares), and the amount of arable land is shrinking as the need for more housing, industry, and roads grows. With only about half as much cropland as the United States, China must feed five times as many people.

China is a nation of farmers: the majority of the labor force, 67 percent, is involved in agriculture. The land has been cultivated intensively for thousands of years using traditional, labor-intensive methods. While farm tasks continue to be performed manually—rice is planted by hand, for example—there is some use of modern farming techniques and machinery, especially in areas of large-scale farming.

Land Ownership

Agricultural land is owned by villages and townships, not by private individuals. In the move away from private ownership under the Communists, farmers were organized into collectives called people's communes. By the early 1960s, millions of family farms had been replaced by thousands of communes, with workers organized into production teams. In the 1980s, reforms created a system of "contract responsibility." Individual farm families are allowed to work a piece of land in return for selling a set amount of produce to the collective at a given price. Farmers profit from the sale of any remaining produce; thus, there are incentives to reduce costs and increase production.

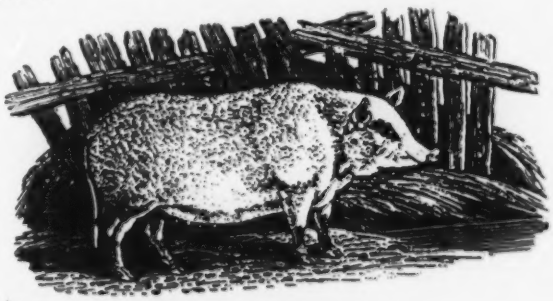
Some farmers are permitted to function as entrepreneurs to produce goods in short supply. There are also large state farms, mainly in remote areas. With their intensive use of fertilizers and pesticides, they represent a shift away from traditional subsistence agriculture.

Growing Grains

The Chinese have had a grain-based diet for many centuries, and grain is the most important agricultural product. China grows more rice than any other country. Rice is the staple diet in the south, while wheat is the staple in the north, where it is made into noodles and steamed bread.

Livestock

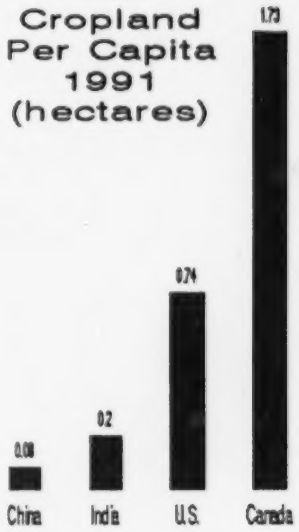
China has more sheep, goats, pigs, and chickens than any other country. Water buffalo, horses, mules, donkeys, oxen, and camels are used as draft animals. Only 19 percent of the grain crop is fed to livestock. One third of China is grassland ecosystems, which support millions of sheep, goats, cattle, horses, and camels.

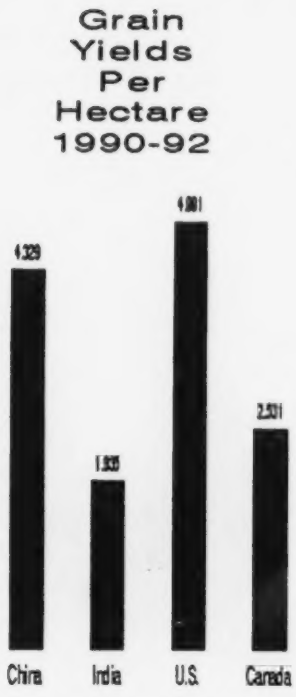


Increasing Production

Agricultural production has increased significantly in the past decade as the country's population has grown. China's average yield of cereals is nearly twice the world average. To produce vast amounts of food for its people with a relatively small amount of land, the Chinese have increasingly relied on double cropping: raising two crops a year on the same land. Other strategies include using fertilizer and high-yield seeds to raise yields on less productive lands. The system is so intensive that China's average annual application of fertilizer is almost three times the average in the United States.

Irrigation is important because China's water resources are unevenly distributed. The region north of the Yangtze River, about 60 percent of the land, has only 20 percent of the water resources, and parts of southern China have limited water re-





sources. Some parts of China receive heavy rainfall while others get little rain.

Threats to Agriculture

Some farm land is being converted and used for housing, mining, industry, shelterbelts (barriers of trees around cropland planted to curb erosion), transportation, and golf courses. This conversion of farmland is a source of some debate in China. Those alarmed about this trend note the small amount of arable land per capita and maintain that further shrinkage could threaten China's ability to feed its growing population. Crop production on remaining lands, they say, will become more intense and inevitably more environmentally damaging.

Others argue that in a time of economic growth, it makes sense to use land for activities that are more productive than agriculture and that generate money that could be used to buy food from abroad if necessary.

A second threat to agriculture is land degradation. About 65 percent of China's land is on slopes or other fragile terrain. There are serious problems with soil erosion caused by drought, flooding, and intensive farming practices that do not allow the land to restore itself. Some cropland is degraded because of improper drainage of irrigated water. Some soil has become salinized (when water evaporates and leaves salt deposits), or waterlogged. In some parts of China, sandstorms have turned farmland into desert. Some farmland has become contaminated because untreated urban sewage and wastewater from industries was used for irrigation.

The Challenge for the Future

On the whole, China's production boom has created an efficient agricultural system, one whose yield per hectare is comparable to that in the United States. Increased food demand will have to be met primarily through higher yields on remaining land and by more intensive cropping. Chinese officials say their primary strategy in the 1990s will be to raise yields on less productive land by expanding use of fertilizer, pesticides, and high-yield seeds. However, the techniques that have increased China's agricultural output have at the same time accelerated environmental degradation. For example, increasing fertilizer and pesticide runoff could further pollute rural waterways. The Ministry of Agriculture is also attempting to promote the use of organic fertilizers and sustainable crop, livestock, and fish production through an "ecological agriculture" pilot program.

Some steps are being taken to slow the conversion of prime farmland to residential and industrial use. China is developing a comprehensive zoning plan for the whole country. One goal of the plan is to prevent net loss of farmland.

Source: *World Resource 1994–95.*

Maintaining Forests and Biodiversity in India

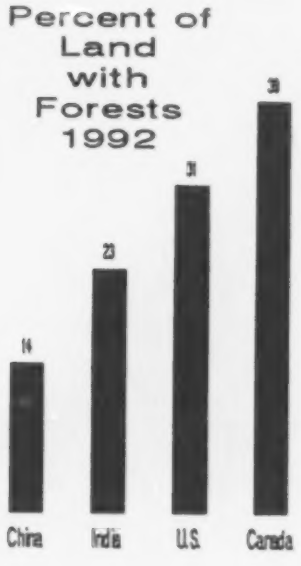
Forests—including semi-natural and degraded forests—cover about 23 percent of India compared to 40 percent a century ago. India currently has about 170 million acres (69 million hectares) of forests. Original forest habitat, which best supports biodiversity, has declined by 78 percent from its original extent. Although this is not as steep a decline as in some countries (notably, the United States, whose original forest habitat has declined 95–98 percent), it poses serious problems considering India's rich genetic and species diversity. Overall, forest cover is no longer shrinking, yet much forest is degraded or planted for industrial use and little original forest habitat remains.

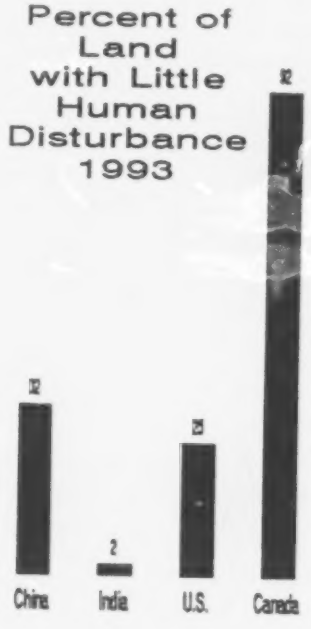
India's forest resources suffer under the needs of a growing population. Wood is the primary fuel for the rural population and an important one for urban dwellers. Forests are also used for livestock fodder, which damages trees, and for grazing, which depletes soil nutrients and threatens plant species used in traditional medicine. Logging of timber for industrial use (for example, the manufacture of paper) and mining activities in forest areas have also destroyed forests.

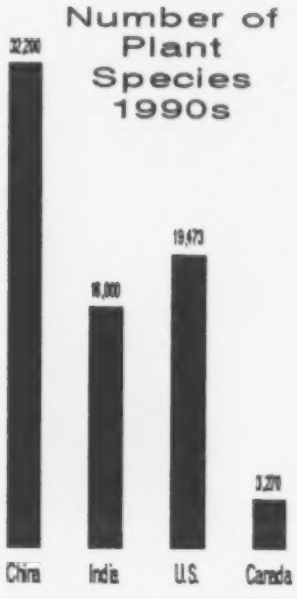
Even the traditional way of life of forest-dwelling people is becoming hard to sustain. Traditionally, village communities owned and protected their forests. But, during British colonization, forests and other natural resources became state property and people lost their traditional rights to access and use.

The Chipko movement in India is a nonviolent effort that was organized in the 1970s by local villagers in the Himalayan regions to regain control of the forests and to protect the mountain ecosystems from commercial exploitation. The local villagers tried to convince government officials and forest contractors that removing native trees even if they were replaced with commercially valuable pine trees was causing ecological instability in the region and depriving local women of their ability to find fuelwood, raise livestock, and feed their families. Locally available varieties of plants were being discarded and locally available knowledge of nature was being ignored. The people were convinced that the destructive cycle of floods and drought and resulting soil erosion that they were experiencing were directly related to the removal of the forests. Mining activities were also destroying forests and local water supplies.

Not knowing how to protect their trees from being cut down, the people banded together and literally embraced the trees to stop the bulldozers. (Chipko means to







hug.) Local villagers also tied sacred threads to the trees as a token of their vow to protect these resources.

Forest officials addressing villagers at a blockade in Adwani in 1977 demanded, "Do you know what forests bear? They produce profit and resin and timber." The protesters responded with a chant that has become a slogan of the movement. "What do the forests bear? Soil, water, and pure air!"

Forest Management

During the 1970s and 1980s, the government established a social forestry program that encouraged tree planting on private farms and community wood lots. In this approach, nongovernmental organizations help local communities form partnerships with government forest departments. Together they make decisions about restricting grazing in the forests, sharing nonwood forest products such as fruits, limiting tree cutting, etc. Involving women in management groups is crucial, because women are usually responsible for collecting and processing fuelwood, fodder, food, and water. Nongovernmental organizations help to promote participation by women and groups that are not part of the local village power structure.

The difficulty of participatory forest management is in dealing with the political complexity of Indian villages, with their unique cultural traditions, various castes, and division of labor between genders and among subgroups. Experience is showing that joint management decisions must grow out of dialogue and that all village subgroups must agree to cooperate.

Throughout India, over 1.2 million acres (500,000 hectares) of reserve and protected forestland are already under community protection through joint management agreements. This approach seems not only to be workable—it also is much less expensive than establishing tree plantations in areas that have been deforested.

Biodiversity

India is considered one of the world's leading "megadiversity" nations. It is home to about 317 species of mammals, 969 of birds, and 16,000 plants. Of these, about 39 species of mammals, 72 of birds, and 1,331 plants are threatened. In response, India has established 75 national parks and 419 sanctuaries covering 4 percent of its land area. Although this is not as much as the 10 percent of area recommended by the World Conservation Union (a percentage achieved by the United States), it is significant progress for a nation with India's population, land-use pressures, and large mammals.

Protecting Tigers and Elephants

Protecting large mammals is a particularly difficult challenge. For example, elephants eat fresh plants and grasses equivalent to 6 percent of their body weight each day. An elephant herd requires a range of 38 to 193 square miles (100 to 500 square kilometers), yet, in some areas, elephant habitat is narrow—only 1.2 –1.8 miles (2 –3 kilometers) wide.

Despite these hardships, the government is still trying to protect its mammals. Project Tiger is the most well-known of these attempts. Beginning in 1973, land was set aside to protect this species, 1,300 of which remain from about 40,000 a century ago. Project Tiger has been hailed as a success, but, lately, there has been an increase in poaching because of the illegal trade in tiger bones for Chinese medicines. What makes Project Tiger innovati that it combines protection with su able human use. This is achieved by establishing core areas free from human interference surrounded by buffer areas for conservation-oriented land use.

Recently, this idea was expanded under Project Elephant. Unlike tiger reserves with their strictly prohibited core areas, these new reserves will accommodate some forestry and farming practices consistent with elephant conservation.

However, it is still difficult to keep people off reserves when India's population is growing and the land could be used for agriculture, industry, mining, or timber. Also, the people living near the forests have traditionally depended on the forest for food, fiber, and medicines as well as fuel and fodder. These local people must be involved if biodiversity is to be preserved. The government, in turn, must assure stable land tenure and clearly defined property rights for local residents to be invested in preservation.

Source: *World Resources 1994-95.*

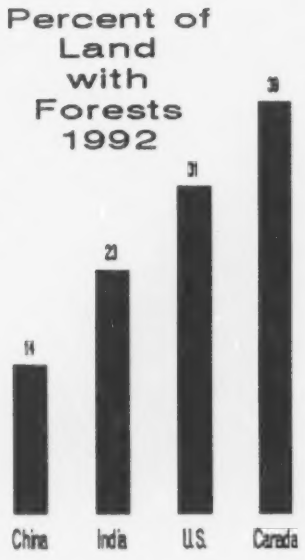
Reprinted from *Essential Learnings in Environmental Education.*

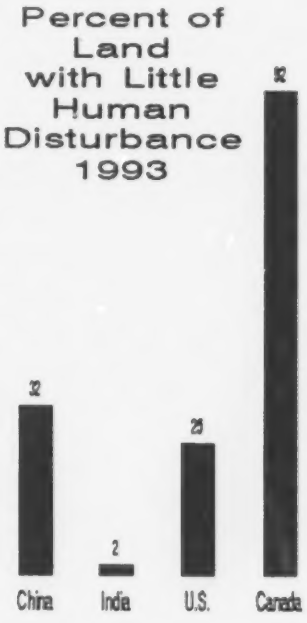
Maintaining Forests and Biodiversity in China

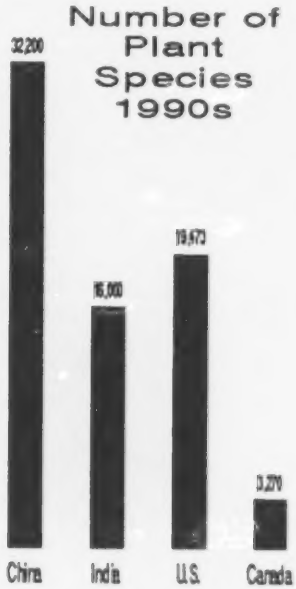
China has gone through several centuries of massive forest loss, and 99 percent of its original forest habitat has been destroyed. China currently has 321 million acres (130 million hectares) of forest area. Pressure on forestland has been severe for decades. For example, in one southern region, forest cover declined from 60 percent in the early 1950s to 30 percent recently. Firewood and charcoal, and other traditional fuels provide about 80 percent of the energy in rural households, and firewood is being harvested at an unsustainable rate. During the past forty years, China's replanting efforts have been extensive. New forests have been planted over vast areas of the nation, protecting crops, reducing soil erosion in agricultural areas, providing a source of local timber and fuelwood, and reducing pressure on China's mature forests.

Although the original survival rate of these trees was not good, forest cover—including semi-natural and degraded forest—has increased from 8.6 percent of land area in 1949 to 14 percent in 1992. During the 1990s, the program should bring forest cover to roughly 17 percent of China's land area.

However, increases in forest cover are primarily due to new tree plantations, while natural forests continue to decline. Thus, genetic and species diversity continues to decline because many newly planted trees are monoculture species (single species cultivated on plantations) not native to the region. These trees are economically inferior as well: harvested timber volume has actually declined over the last decade, despite an increase in forest







cover. As a result, wood demand continues to exceed supply.

Biodiversity

China ranks among the top 10 nations in the world for the diversity of its mammal, bird, amphibian, and plant species. In fact, China has more species of plants (32,200) than any other country except Brazil and Columbia. But, for all its biodiversity, China faces serious threats to its biodiversity from population and industrial pressures.

Ten percent of China's mammals are threatened, as well as 83 bird species, and 307 plant species. The giant panda is the most well-known of these; there are many others including the tiger, snow leopard, golden monkey, and green turtle. In response, China has established 606 nature reserves covering 3.2 percent of its land area.

The rapid creation of reserves, however, has led to management problems. Six different national agencies are responsible for some sites, and not all agencies have expertise in nature conservation. Typically, managers have limited funds and little decisionmaking power. For example, the Ministry of Forestry controls pandas in the wild while the Ministry of Construction manages pandas in zoos, a situation that invites conflict and breeds reluctance to share information and resources.

In accordance with the 1992 Earth Summit Biodiversity Convention, China has completed a national biodiversity action plan and is working to implement it. Forty natural areas have been identified as exceptionally important. Nevertheless, China still has far to go to protect its threatened species adequately and preserve the 10 percent of land area recommended by the World Conservation Union.

Source: *World Resources 1994–95.*

Reprinted from *Essential Learnings in Environmental Education.*

India's Energy Prospects

India is one of the developing world's largest consumers of energy and is among the top 20 users of commercial energy in the world. Total commercial energy use doubled between 1971 and 1991. However, India's total energy consumption is much less than either the United States' or China's.

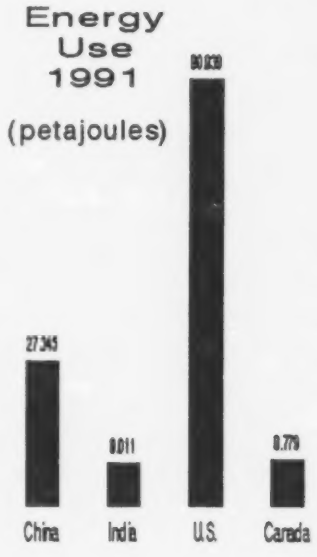
On a per capita basis, India uses much less energy than an industrialized nation such as Canada. Only about one third of Indian homes have electricity.

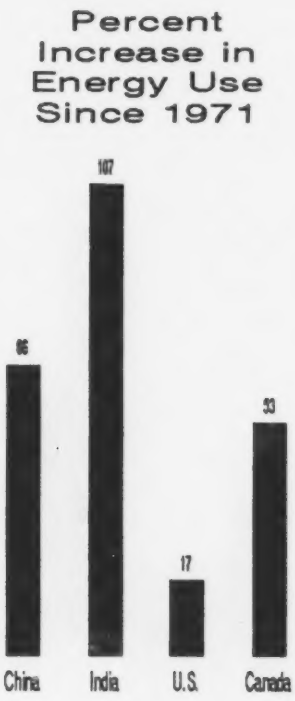
Sources of Energy

India's energy sources are diverse:

- Coal provides about 70 percent of commercial energy, and is mined in the eastern part of the country and transported by rail to the north, west, and south. Coal production more than doubled between 1980 and 1992, and is expected to reach 400 million tons (363 million metric tons) by 2000.
- Oil accounts for one third of all commercial energy. India rapidly developed its oil resources in the 1970s and early 1980s, and, while it still has substantial coal and oil reserves, since 1985, production has been relatively stagnant, and India has become more dependent on imported oil. About one quarter of foreign exchange earnings are used to buy oil.
- Natural gas, which now supplies 8 percent of India's commercial energy needs, is expected to be used more in the future.
- Hydroelectric power plants are an important source of electricity. There is great potential for hydro power, and the government is encouraging small hydro plants. Large plants are difficult and expensive to build. There are also nuclear power plants.
- Large dams are a controversial environmental issue in India. The Narmada Valley Project in western India, which involves the building of 30 major dams and hundreds of smaller dams, will provide millions of farmers with irrigation as well as 1.4 million kilowatts of electricity, but could, at the same time, displace 1 million people. Valuable forest land and wildlife habitat would also be lost. There has been considerable opposition to the project and many large-scale protests have been staged.
- Traditional fuels meet one quarter of India's total energy needs and are especially important in rural areas. India's use of traditional fuels totaled 2,800 petajoules in 1991. Wood is commonly used for cooking and heating, even in cities, thus placing heavy demands on India's forests. Large quantities of fuelwood are shipped by train and truck into urban areas. In rural areas, crop residues and animal dung are also used as fuel. There is little access to commercial fuels.

Reprinted from *The State of India's Environment 1984–85.*





Energy Use

India suffers from energy shortages and now produces about 10 percent less electricity than is needed. Unscheduled brownouts and blackouts are common, and utilities schedule power outages. Shortages have grown worse because low energy prices don't provide sufficient return to producers. Also, there is widespread inefficiency; more than 20 percent of electricity is lost during transmission and distribution. Industries use energy inefficiently due to outdated, inefficient equipment and processes. For example, it takes twice as much energy to make steel in India as in industrialized countries. Government subsidies tend to discourage conservation. For example, low energy prices encourage farmers to overuse electric irrigation pumps, driving up agricultural demand for electricity by 15 percent annually and contributing to system overloads.

Future Energy Needs

India is expected to become more and more important as a global energy consumer. Energy demand will continue to be influenced by population growth, by industrial expansion, and by increased residential energy use by middle and upper income groups, who are using more consumer products (televisions and refrigerators).

Energy demand could increase fourfold by 2025; carbon emissions could increase sixfold as fossil fuels replace biomass (fuelwood, crop residues). India currently accounts for 3 percent of global carbon dioxide emissions.

India is encouraging further use of renewable sources of energy (wind, solar, hydro, or biomass) particularly to solve its rural energy problems. India may be able to burn agricultural waste such as rice hulls or sugar cane in conventional boilers to increase rural electrical supplies. India also has the largest solar cooking program in the world with over 238,000 solar cookers sold at the end of 1992. Wind turbines and small-scale hydropower are also promising options for India.

Source: *World Resources 1994-95.*

Reprinted from *The State of India's Environment 1984–85.*

China's Energy Prospects

China is the third largest energy consumer in the world. The United States and the former Soviet Union rank first and second. China rose to this position almost overnight. Energy use increased 66 percent between 1971 and 1991, compared with an average increase of 45 percent in the industrialized countries. China is the fourth largest user of electricity in the world.

However, on a per capita basis, China's energy use is low. A typical Chinese household used less than 0.03 percent of the energy consumed in the average American home. This figure is changing as modern appliances find their way into many Chinese homes. Urban families are more apt to have sewing machines, radios and televisions, washing machines, and refrigerators than rural families. Seventy percent of rural households have access to electricity, but restricted supplies make rural electricity consumption just a fraction of urban consumption. About 200 million rural Chinese have no electricity whatsoever.

Sources of Energy

- Coal provides more than 80 percent of all commercial energy, but the reliance on coal creates problems. Coal is mined in the north and northwest, while the population and industry are in the east and south. Long-distance coal transportation ties up 40 percent of China's rail system, leading to massive bottlenecks and shortages. Heavy use of coal with a high sulfur content also causes air pollution and acid rain, while mining creates land degradation and ground and surface water pollution. China also currently contributes 11 percent of global emissions of carbon dioxide.

- Oil provides 19 percent of China's energy. China has invited foreign oil companies in to help exploit its oil resources. Currently, Exxon is leading a group to explore for oil in the Tarim Basin, a remote area in western China almost as big as Texas.

- Natural gas provides only a tiny fraction of China's energy. Supplies are thought to be large but have not been exploited.

- Hydropower produces 20 percent of electricity; there are large hydro projects as well as extensively developed microhydro projects important in rural areas. Only about 10 percent of China's potential for hydropower has been exploited.

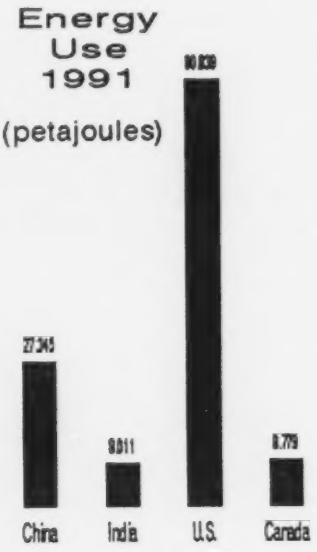
- China is currently building what will be the world's largest hydroelectric dam, the Three Gorges—which will have a capacity of 17 million kilowatts. The dam is expected to relieve flooding in the middle and lower sections of the river.

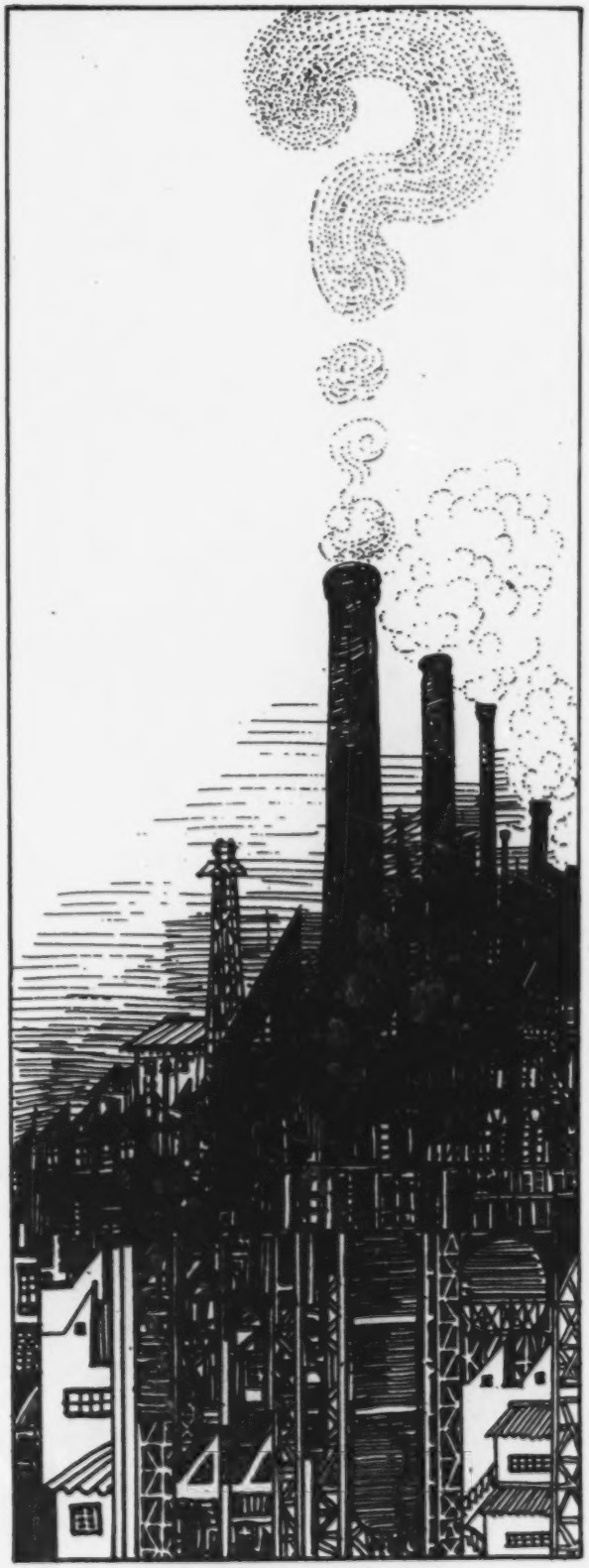
  There is considerable opposition both within and outside China because of the social impact of the project. According to estimates, 1.1 million people would be displaced by this project. The government has plans to construct new towns and urban areas, reclaim wasteland for growing crops, and resettle the citizens on nearby hillsides. However, previous resettlement projects have been handled poorly. The dam would also destroy some well-known scenic spots that are important sources of tourism.

- Traditional fuels provide 80 percent of the energy used in rural households and 7 percent of the country's total energy consumption. Traditional fuels include fuelwood, charcoal, bagasse (sugar cane production waste), and animal and vegetable wastes. Fuelwood is being consumed at an unsustainable rate, and there are shortages.

Energy Use

China suffers from persistent, severe shortages of electricity. One third of all industries are unable to operate at full capacity, and residential customers experience regular blackouts and brownouts. Inefficient use of energy contributes to shortages. On average, China's major industries consume some 30–90 percent more energy than similar industries in developed countries. It takes 60 percent more energy to produce steel and 40 percent more energy to produce paper. Inefficient coal-fired industrial boilers and kilns are big wasters of energy. Because the price of energy is low, there is little incentive to conserve it.





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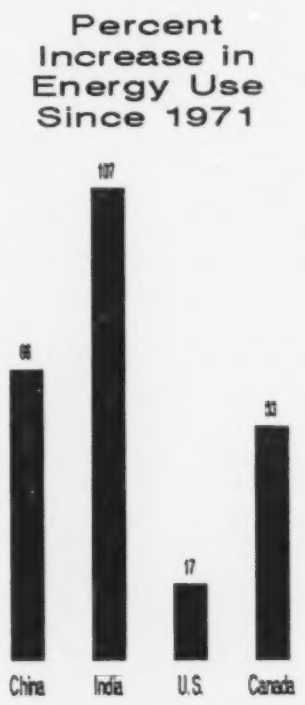


Future Energy Needs

China's energy consumption is projected to increase, doubling or even tripling by 2025. Growing energy demands are likely to triple coal consumption and CO_2 emissions over the next 35 years. Air pollution from coal burning is already a serious problem in cities where coal is used in cooking and heating stoves. Unless China is able to switch to alternative fuels, the problems of air pollution will only become more severe.

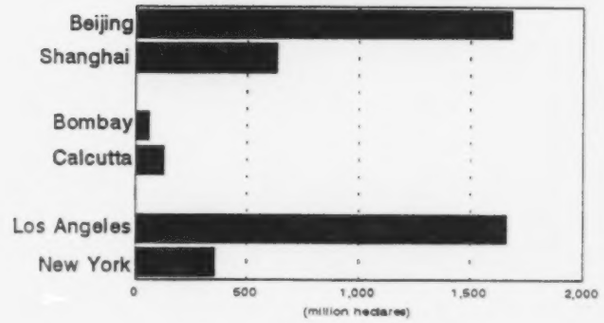
China's government is planning to increase energy efficiency in a variety of ways: building more efficient coal-powered generating plants, replacing outdated industrial boilers, producing more efficient coal briquettes. Plans to expand the supply of energy include building hydropower plants, developing nuclear power, and using natural gas for heating and cooking.

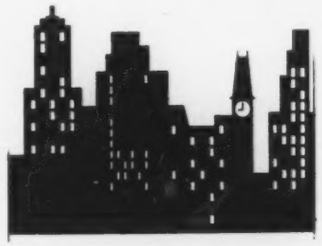
China hopes to meet rural energy needs by investing in renewable sources of energy (wind, solar, hydro, or biomass). China has wind energy farms, photovoltaic factories and small hydro dams, but investment in renewables is only a small fraction of the total energy investment.

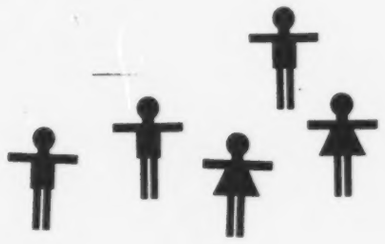
Source: *World Resources 1994-95*, and R.L. Worden *et al.*, eds., *China: A Country Study*, (Federal Research Division, Library of Congress, Washington, D.C., 1988).

Six Megacities

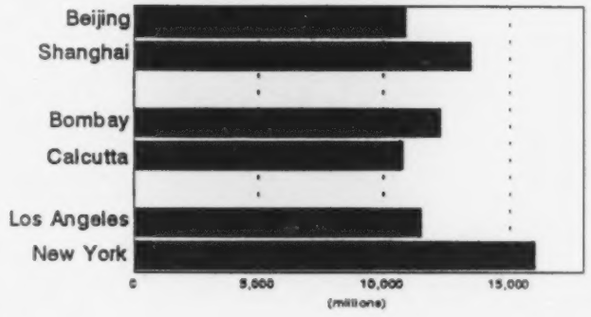
City Size



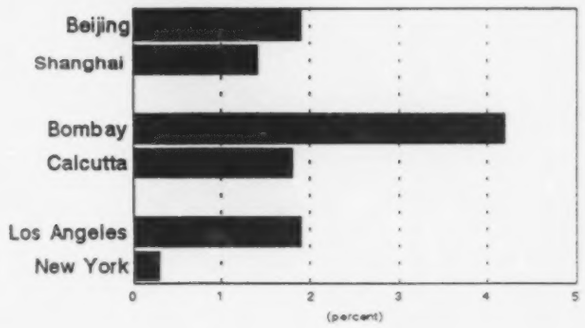




City Population, 1990

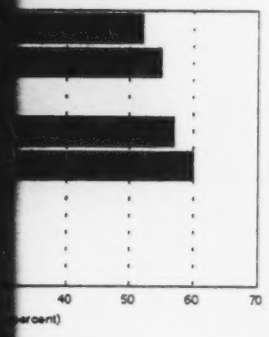


Annual Population Growth Rate

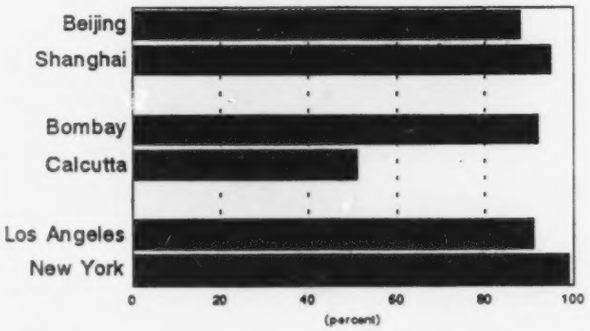


Persons per Room, 1989

usehold Income
Food, 1989

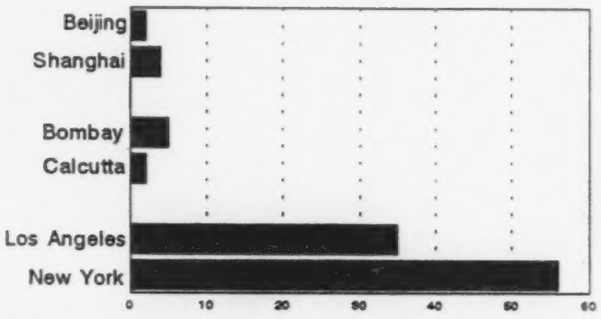


Percent of Households with Running Water, 1989



Households
ricity, 1989

Telephones per 100 People, 1989



Voices of India

Selection 1 Indira Gandhi on Environment

We should move away from the single dimension model which equates the growth of GNP with development. Our emphasis should be on the qualitative improvement of life as a whole rather than on the quantitative growth of various sectors of economy. Our attention cannot be diverted from the main question before us which is to bring basic amenities within the reach of our people and to give them better living conditions without alienating them from nature and their environment, without despoiling nature of its beauty and of the freshness and purity so essential to our lives. . . .

Concern with economic and social development need not be a choice between poverty and pollution. To most people, progress has become synonymous with imitation of Western models. But wherever we have followed models from the industrial society and been insensitive to our own circumstances the results have not been happy. The time has come for us to think deeply about the kind of progress we want. . . .

One of our immediate goals is to be self-reliant in [the] economic sphere. Is it not as important to be independent in our thinking?

We should be mature enough to resist the temptation of nonessentials which glitter for a while. It is only when man is able to make the right choice at every stage and to distinguish between the essential and the expendable that he can give attention to the more worthwhile aim of improving himself and finding fulfillment.

I should have thought that progress would mean an enriching of the spirit and clarity of mind so that man would become more sensitive and aware and would think more precisely and comprehensively. He should have the capacity to live at peace with himself, with his fellow men, and with nature. Technology must bring us comfort and freedom from drudgery. But we find that in countries that have reached the stage of affluence an ever-increasing number of thinking people are acutely unhappy and attempting various methods of escape. Most of the others believing what is fed to them by the many glossy magazines and oblivious to the emptiness of their own lives become engrossed in the race for more possessions as if that were a substitute for a full life.

Source: Department of Environment, Government of India, *Indira Gandhi on Environment* (Department of Environment, Government of India, New Delhi, 1984).

Selection 2 Traditions, Concerns and Efforts in India

Poverty, however, remains the central issue and the biggest challenge. While the annual per capita income has been slowly rising over time, about 40 percent of the people are below what is considered the poverty line. The challenge is therefore not only to find development paths and models that are environmentally sustainable but that are also socially just and culturally acceptable. For a very large number of the poor who depend on the resources of their immediate environment, poverty has been compounded by environmental degradation. Not only does the natural resource base of the immediate environment provide their basic requirements, it is also the basis of their livelihood and security. The challenge of poverty and the challenge of environment are therefore not two different challenges but two facets of the same challenge.

The problems are complex and the choices difficult. Each issue needs its own resolution, not a borrowed solution. . . . A national Ministry of Environment and Forests was set up in 1985. Most states have set up Departments of Environment and associated agencies. Several hundred institutions and several thousand NGOs are . . . working with the challenges of environment and development. But the most hopeful sign perhaps is an increasing number of people who, individually and through their communities, are taking action—action that leads to a better environment and a better life.

Source: Ministry of Environment and Forests, Government of India, *Traditions, Concerns and Efforts in India,* National Report submitted to the United Nations Conference on Environment and Development in Rio De Janeiro, Brazil (Government of India, New Delhi, 1992).

Selection 3 The Wisdom of Mahatma Gandhi

Mahatma Gandhi warned that "nature had enough for everybody's need but not for everybody's greed."

Source: Dwivedi, O. P., "Satyagraha for Conservation: Awakening the Spirit of Hinduism," in *Ethics of Environment and Development: Global Challenge, International Response,* J. Ronald Engel and Joan Gibb Engle, eds. (The University of Arizona Press, Tucson, Arizona, 1990).

Selection 4 The Culture of the Poor: Is Equitable Development Possible?

The poor in India are not wretched or passive, nor really overpowered by poverty. They are terribly deprived of all aspects of physical well being—they are literally worked to death by the society and the environment but they are not pessimistic. They are aware, alert, carving spaces for themselves against all odds. . . .

Each morning we read newspaper reports on the destruction of spaces that poor people occupy through some intervention in the name of technological progress or economic growth. Lately, there has been much discussion on the plight of the fisher folk of Tamil Nadu, Kerala, and Karnataka as a result of Fisheries Development projects. Earlier, there were reports of the struggles of the poor to have access to their forests for both fuelwood and food and work, and the greed and need of forest-based large-scale industry. . . .

Each of these has been seen as resistance to modernization, and to the inevitable structural changes that tend to improve the standard of living of the country. Little is it realized, however, that the space—the geographical area as well as metaphorical—that is occupied by the poor is not only legitimate, but sensible . . . . This encroachment of their territory will land the country in situations of dependence, crisis and conflict. . . .

The first step in my view is the acceptance of a philosophy based on personal ethics—strong, self-confident individuals. The second is identification with the poor—learning from the poor, believing in their intelligence, strengthening their own capabilities to the extent that they cease to be poor but without disturbing their own cultural lifestyle. The culture of poverty can be the paradigm for development—not the poverty but its culture—the attitude, the choices, the interlinks and exchanges that this culture provides. This possibility is highlighted or illuminated significantly by the lives of poor women.

Thus, when Gandhi idealizes the village, it is not that he does not realize that the village is a hard place to live in. However, he sees the possibilities of making the village a way of life, which can contain human greed—thus avoiding conflict and ensuring peace.

Source: Jain, Devaki, "The Culture of the Poor: Is Equitable Development Possible" in *Cultural Forces Shaping India*, Sr. Karuna Mary Braganza and Saleem Peeradina, eds. (All India Association for Christian Higher Education, New Delhi, 1989), pp. 71–77.

Selection 5 An Interview with Vandana Shiva

Interviewer: Who should decide what we should tinker with or not tinker with? Would it be the state? And would that not lead to a state-controlled system of development and away from a market-based approach?

Shiva: There is a third entity, which is forgotten . . . . That is real living communities of people who are in contact with the environment, be it polluted or pure. Those communities have systems of knowing the state of their ecosystem and how ecosystems hang together or get destroyed. We should be listening to those communities. Listening to those communities is the primary political issue, in my view. . . .

Both market and state systems need limits in order to keep them from doing damage. Those limits can only be grasped by listening to what people have to say. People realize long before governments do that toxic dumps cause hazards.

Interviewer: It sounds as if you place a great deal of faith in the wisdom of local communities. But are there not communities that do not have the best interest of their ecosystem at heart?

Shiva: It is only when livelihoods are linked to the survival of the ecosystem that protection of the ecosystem becomes the economic logic of a community. That is why, in my view, the kind of mobility that is part of development is the biggest hazard, because uprooted people have no stake in the environment and development creates displacement and uprootment. The more you create social and cultural conditions that lead to displacement, the less chance there is that there will be communities that have knowledge, wisdom, or values that lend themselves to protecting the environment. I believe that if you don't have communities that retain their roots, no government and no market can protect the ecosystems. The markets will always need to be told that they are overstepping boundaries. Markets work on maximizing profits, which means forgetting about what you are destroying. Growth is premised on creating markets where they should not exist, creating addiction so that people will want, and need, and desire the things they don't really need and desire.

Interviewer: Does not this logic lead to the inability of a society to engage in any large-scale construction such as the building of an airport?

Shiva: If enough people say "no" to the wrong thing then we will be able to create the right thing. By having enough "no's" we will be able to create systems of living and human settlements where people don't have to spend four hours a day sitting like zombies in cars. I think enough "no's" will create the alternative structures that are more peaceable. I believe we need more "no's" than we are getting just now for the destruction that is around us.

Source: Lerner, Steve, *Beyond the Earth Summit: Conversations with Advocates of Sustainable Development* (Common Knowledge Press, Bolinas, California, 1992), pp. 77–86.

Voices of China

Selection 1 National Report of the People's Republic of China on Environment and Development

In the long history of human development, the great Chinese nation, with an ancient civilization and development history of 5,000 years, generated a glorious culture and contributed notably to the progress and prosperity of mankind. Since the founding of New China in 1949, under the leadership of the Chinese Communist Party and the People's Government, the Chinese people have turned the old China of poverty and backwardness into a relatively prosperous socialist country by relying mainly on self-reliance and arduous efforts. Since the 1980s, China has pursued the policy of reform and opening up to the outside world. This decade of rapid economic growth and significant achievements has laid a fairly solid foundation for China's socialist modernization drive . . . .

As a developing country, China must unswervingly give first priority to her national economic development in order to achieve prosperity and her socialist modernization. Economic construction must be the core around which all her national efforts are forging ahead. . . . Environmental protection as an important component of the national socio-economic development, must serve the purpose of promoting economic progress and improving the people's quality of life. At the same time, environmental pollution and ecological degradation should also be prevented or brought under control in the process of national economic development. . . .

China began her economic development and construction under the constraints of an enormous population burden and a rather backward level of national economy and science and technology. With the growth in the nation's population, development of economy, and rise in consumption level, the pressure on the ecological environment kept increasing. . . .

The decade of the 1990s is a crucial period for China's socio-economic development and environmental protection. The task of achieving a coordinated development of the two remains arduous. . . .

The envisaged objectives of the Chinese Government . . . for the coming decade are as follows . . . .

- China's social and economic development will be marked by nearly 6 percent average annual increase in her GNP and by moving from the provision of adequate food and clothing to the achievement of a relatively comfortable life for her people . . . .
- As China's economy develops, environmental pollution will be basically brought under control, environmental quality of key cities will be improved in varying degrees, and the natural ecological deterioration will be alleviated.

Source: Yalin, Chen, ed., *National Report of the People's Republic of China on Environment and Development* (China Environmental Science Press, Beijing, 1992).

Selection 2 The Environmental Tour of the Century

About 100 journalists from the People's Daily, the Xinhua New Agency, China Central Television, and other national news organizations will leave Beijing this week to embark on a tough assignment: writing in-depth stories about the country's serious environmental and ecological problems.

The "China Environmental Tour of the Century," an environmental propaganda campaign primarily organized by the news media, was launched across the country today. Premier Li Peng of the State Council wrote an inscription for the campaign which reads: "Environmentalists make contributions contemporarily and their work will benefit the country for thousands of years."

This unprecedented mass media campaign to publicize environmental problems was organized by the Environmental Protection Committee of the National People's Congress (NPC), the Chinese Communist Party's Propaganda Department, the Ministry of Radio, Film and Television, and the State Bureau of Environment Protection.

The campaign reverses the practice of providing minimal space in the press to the problems China faces as it pushes forward with its economic modernization plans.

"As a large developing nation, China has played an increasingly important role in international environmental affairs," said Qu Geping, Chairman of NPC's Environmental Protection Committee. "For decades, despite a shortage of funds, China has made significant achievements in the control of environmental pollution and maintaining ecological balance," he noted.

"This press campaign has once again shown the determination of the Chinese people in cleaning up the Earth," he said. The theme of this year's environmental campaign was to declare war against environmental pollutants. . . .

Source: Xinhua News Agency, "Press to Give Wide Coverage to Environmental Problems," October 5, 1993, Beijing (press release).

Selection 3 China Faces Ten Ecological Problems

An alert report, "The Ecological Deficit: Future Crisis That Chinese People Have to Fight for Their Surviving," which was compiled by the Chinese Academy of Sciences' Eco-Environmental Research Center for the State Science and Technology Commission, lists the 10 most serious ecological problems China is facing:

(1) Improper development and [use] of mountain and ecologically fragile areas . . . . has accelerated large-scale soil erosion and ecological imbalance.

(2) Increasing natural disasters [are] expanding areas of damage and environmental deterioration.

(3) Gradual shrinkage of forested areas caused by [excessive clearing] has turned China into a poor forestation country.

(4) Unplanned reclamation and long-standing herding have speeded up degeneration of grassland; about one-third of China's utilizable grassland [is degraded].

(5) Desertification is getting serious. For example, in northern China, an area of 1.49 million square kilometers, or 15.5 percent of Chinese territory, has desertified.

(6) Overpumping and overpollution of groundwater has brought serious water shortage problems to China.

(7) Overpopulation and unbalanced distribution of natural resources are also the causes of China's serious environmental problem.

(8) Air pollution is getting worse, areas damaged by acid rain are expanding, solid waste and human residue are mounting.

(9) Forty percent of township enterprises are becoming major polluters, increase in pollution of agriculture and forestry will surely offset economic growth.

(10) China has already encountered heavy economic loss caused by environmental deterioration. Chinese people's lives and the security of their property are being threatened by the vicious cycle of unexpected accidents.

Source: Zhaomin, Liu, "China Faces Ten Ecological Problems," *Hebei Ribao Economic Supplement* (August 11, 1993), p. 1.

Selection 4 Ancient Wisdom and Sustainable Development from a Chinese Perspective

At the end of the twentieth century, the rivers and lakes of our planet are dying, the seas are poisoned, and the continents are becoming garbage dumps. The supposedly most intelligent animal that ever walked the Earth is killing every fellow co-inhabitant. This is the world our generation is handing over to posterity. As more and more of us wake up to this painful reality, the air of helplessness thickens. We may lose our battle for survival. . . .

The so-called First World (primarily the West and Japan) is upsetting the ecological balance of our delicate biosphere with its wasteful way of life. With one-quarter of the total world population, it is using three-quarters of the world's resources, shamelessly, to the jealousy and anger of the rest. And 'the rest' is losing little time catching up. In the 1980s, the Second World—Russia, Eastern Europe and China, among others—shook off its ideological burdens and took decisive steps to imitate the West. While its degree of success remains to be seen, the outcome, whatever it may be, gives little comfort. If these giants should succeed in 'modernization' (which amounts to little more than trying to adopt a Western style of life, as symbolized by Coca Cola and jeans), they will add a fatal pollution burden to the Earth (imagine 1 billion Chinese each throwing away a packet of tissues a day). . . .

The West, with its unending enthusiasm for discovery and innovation, has done the human community a great service by providing modern societies with various tools and material comforts. Now, just as the rest of the world is imitating the West, it is alarming to note that things are going disastrously wrong, and the cause somehow lies in the basic philosophy of life of many Westerners. As described by Eric Fromm, this philosophy is wanting 'to have' rather than 'to be'. It is our belief that the ancient art of living based on 'letting go' may provide one of the alternatives for those who ask, in the face of mounting threats to the Earth, what we should do.

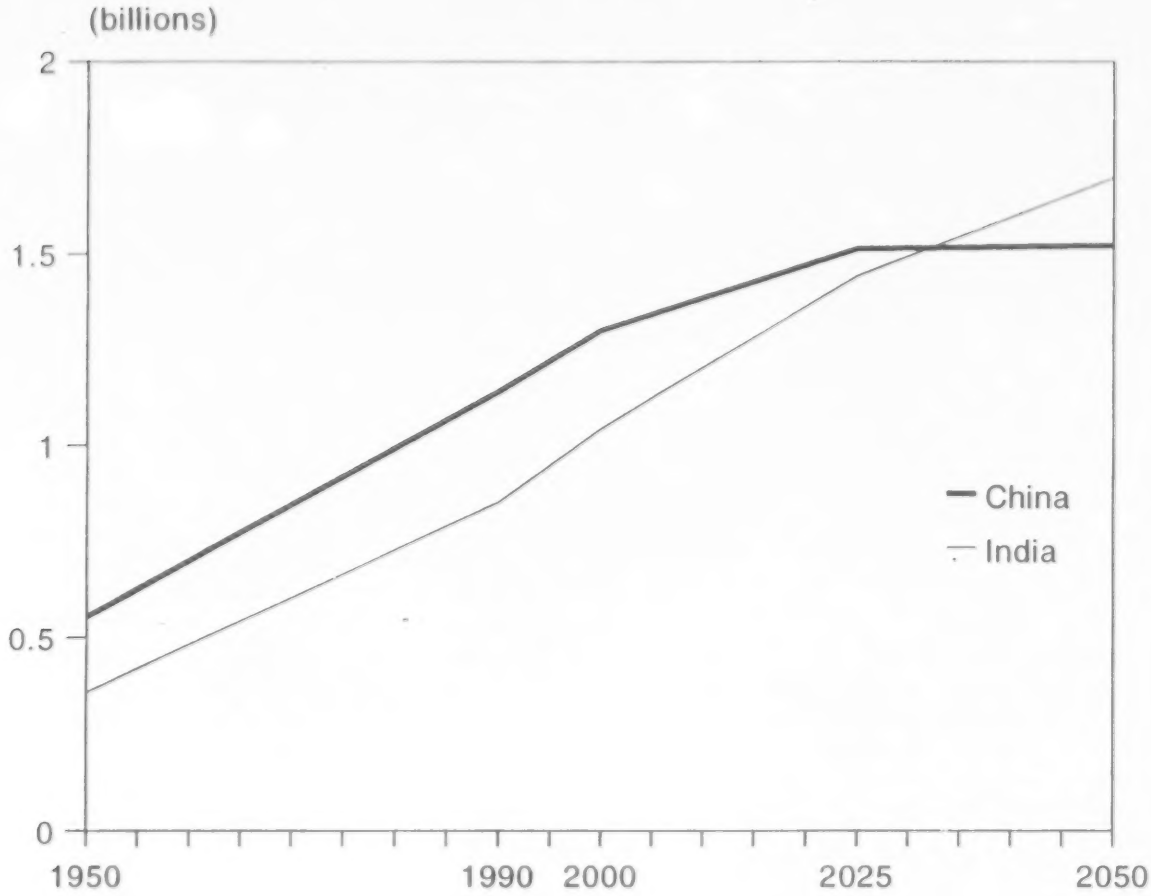
In a recent talk on "Where is the Green Movement Going?", a colleague of ours, a leader of the local Buddhist modernization movement, relates the green ideal to ancient wisdom in this way.

> Although there are external causes for environmental pollution, basically it is a problem of the mind; it is our greed, our desire to possess, our inflation of the self. So, in addition to introducing legal regulations, we must also establish a philosophy of non-greediness to sublimate men's desires. By exhorting the virtue of thriftiness, resources will no longer be wasted.

We must not think that such a value system is a backward one which belongs to an agricultural society. Rather, it is an excellent way to counterbalance man's selfishness, and it has stood the test of philosophizing and practice down through the ages. We cannot allow the selfish elements within human nature to triumph; the same applies to agricultural as well as industrial societies . . . . We have to learn from history, digging up ideas that are eternal, so as to reconstruct the world of values for the modern man.

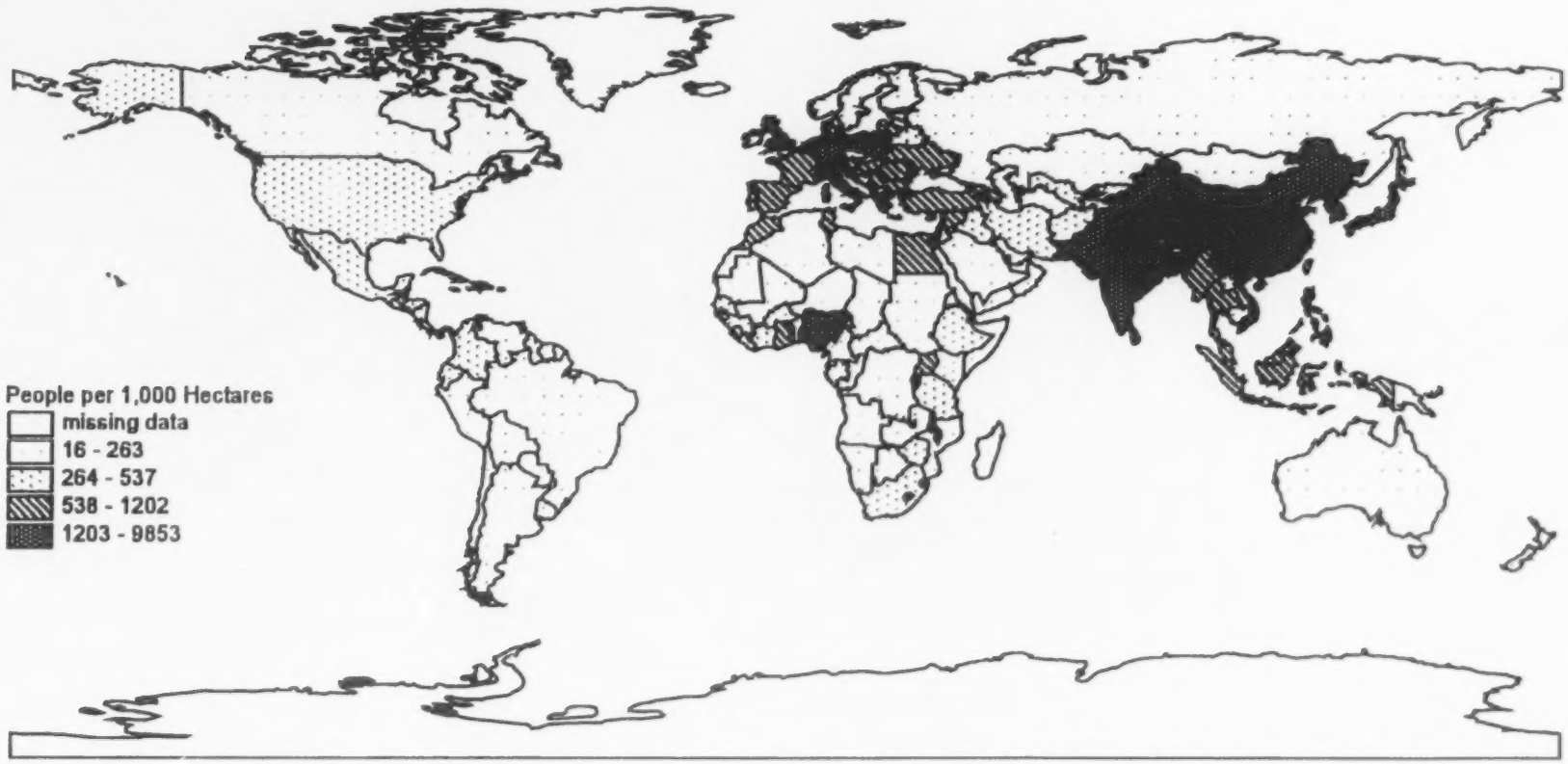
Source: Chau, Simon Sui-Cheong and Fung Kam-Kong, "Ancient Wisdom and Sustainable Development from a Chinese Perspective," in *Ethics of Environment and Development: Global Challenge, International Response*, J. Ronald Engle and Joan Gibb Engle, eds. (The University of Arizona Press, Tucson, Arizona, 1990).

Population, China and India, 1950–2050



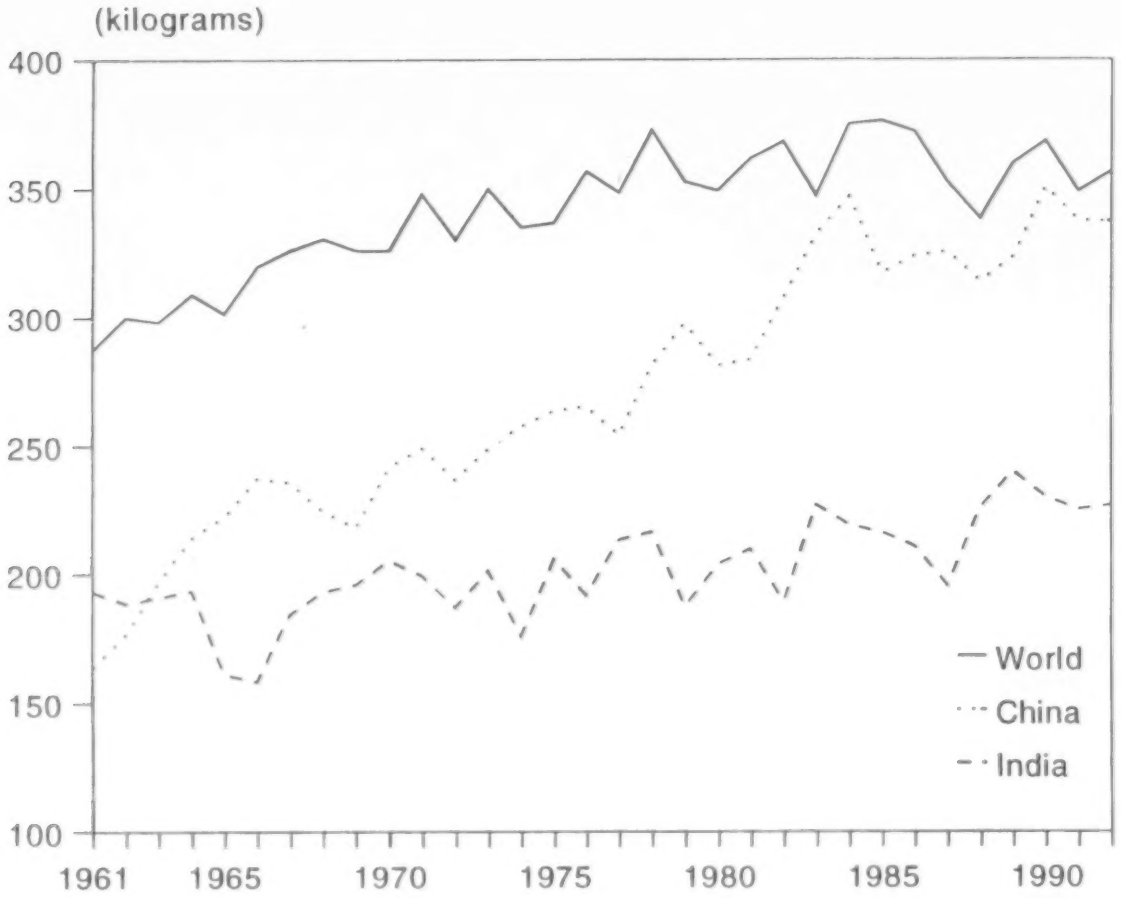
Source: United Nations (U.N.), *Long-Range World Population Projections* (U.N., New York, 1992).

Population Density



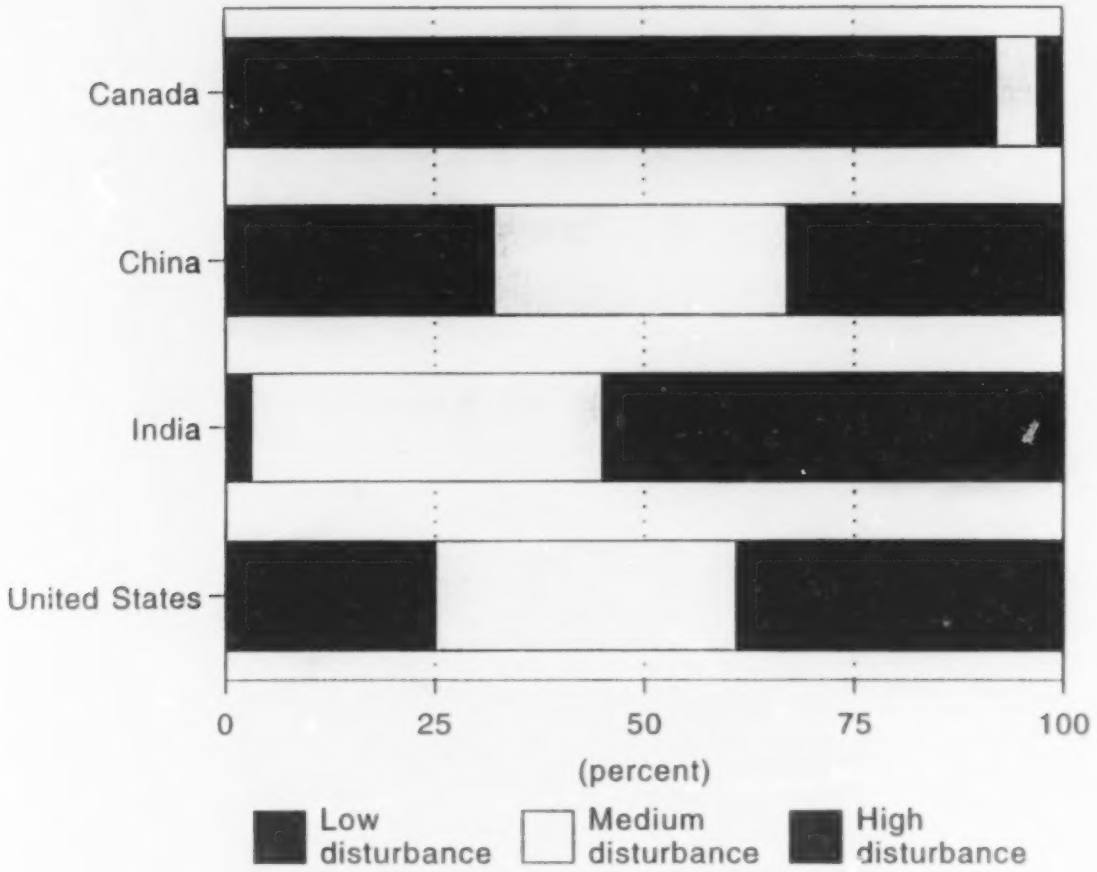
Sources: Data on land area are from the United Nations Food and Agriculture Organization (FAO), *Agrostat-PC*, on diskette (FAO, Rome, July 1993). The data on population are from the United Nations Populations Division (UNPD), *Interpolated National Populations (The 1992 Revision)*, on diskette (UNPD, New York, 1993).

Per Capita Cereal Production, 1961–90



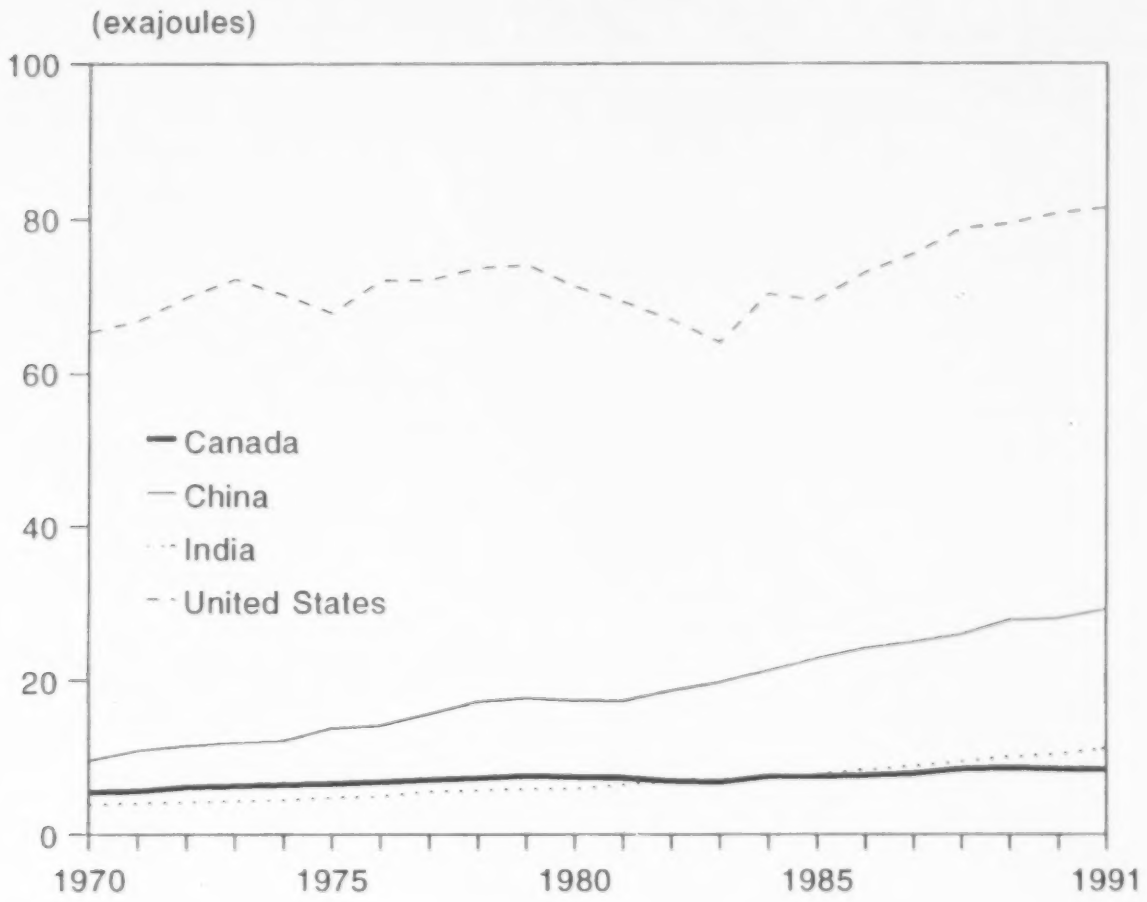
Source: Food and Agriculture Organization of the United Nations (FAO), *Agrostat PC*, on diskette (FAO, Rome, 1993); and United Nations Population Division (UNPD), *Interpolated National Populations (The 1992 Revision)*, on diskette (UNPD, New York, 1993).

Degree of Human Disturbance, Vegetated Land Area, 1993



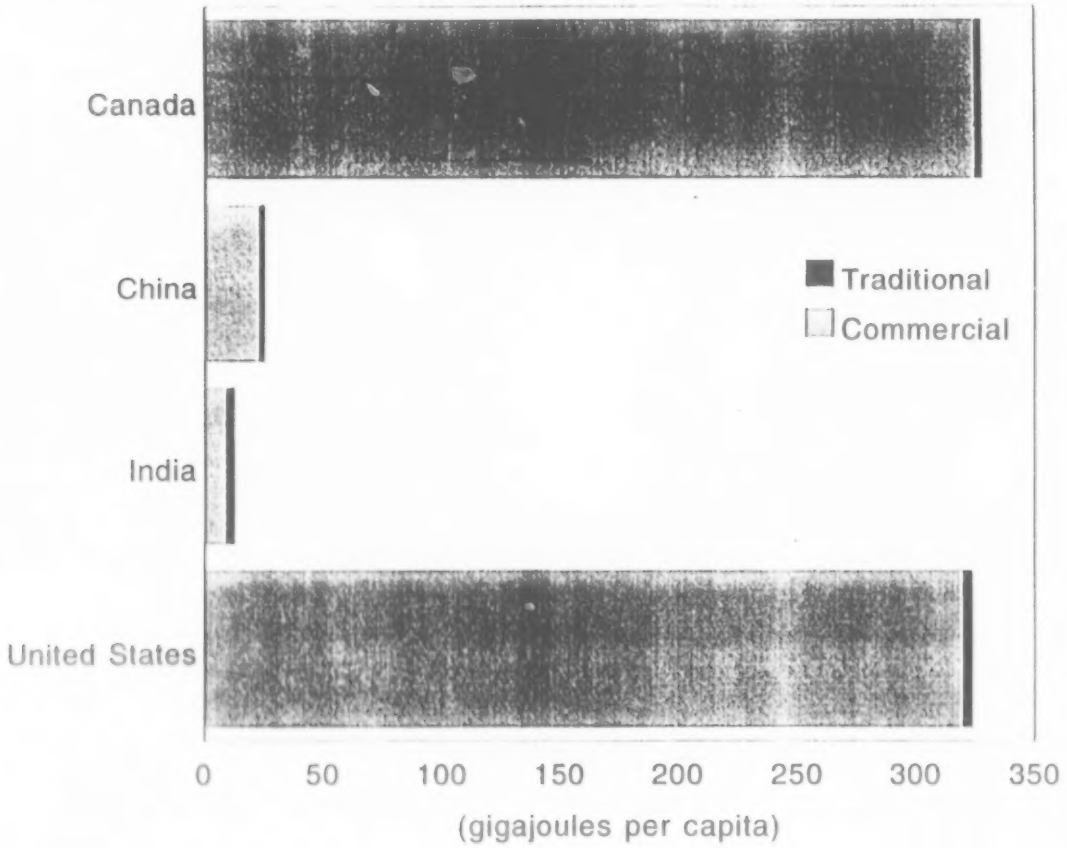
Source: *World Resources 1994–95,* Table 20.2 and p. 328.
Note: The underlying data vary considerably in quality, and areas of low human disturbance are likely overrepresented due to dated or inaccurate information.

Total Energy Use, 1970–91



Source: adapted from data found in *World Resources 1994–95*, pp. 334 and 335, Table 21.2 Energy Consumption, 1971–91

Energy Consumption Per Capita, 1991



Source: United Nations Statistical Division (UNSTAT), "U.N. Energy Tape," (UNSTAT, New York, 1993), and World Resources Institute in collaboration with the United Nations Environment Programme and the United Nations Development Programme, *World Resources 1992–93* (Oxford University Press, New York, 1992).
Note: Data are for 1988.

Teacher's Survey
Teacher's Guide Units

(Please use additional paper if necessary)

1. Which *World Resources Teacher's Guide* unit did you use?

___1. Biodiversity
___2. Car Trouble
___3. Citizen Action
___4. Energy, Atmosphere, and Climate
___5. Natural Resource Economics
___6. Oceans and Coasts
___7. Population, Poverty, and Land Degradation
___8. Sustainable Development
___9. Two Giants: China and India
___10. Watershed Pollution
___11. Women, Equity, and Sustainable Development

2. Course(s) in which you used *World Resources Teacher's Guide* units?

___History ___Geography ___Science
___Ecology ___Biology ___Chemistry
___Environmental Studies ___Environmental Science ___Other

3. Which sections of the unit did you find most useful?

___Teaching Strategies
___Student Enrichment Activities
___Student Handouts
___Overhead Transparency Masters
___Reading and AV Lists

4. How much do you think you will use the *World Resources Teacher's Guide* units in the future?

___Often ___Occasionally ___Rarely

5. Did you use the Goals 2000 draft national performance standards to select material from the units?

___Yes ___No

6. If yes to the above question, which performance standards did you teach?_____

_____

7. Were the recommended activities in the unit useful in teaching those standards?

___Yes ___No

8. What features could be added to the *Teacher's Guide* to make it more useful to you?

_____

_____

_____

9. In what setting did you use the *Teacher's Guide* units?

___Middle school ___12th grade ___Nature center
___High School ___Community college ___Zoo
___10th grade ___College or university ___Museum
___11th grade ___Adult education ___Other

10. Was the material appropriate for your audience?

____Yes No, because_____

11. If you used the unit in a school, how much class time did you and your students spend on it?

____Less than 1 class ____2–3 classes ____1–2 weeks

____1 class ____4–5 classes ____More than 2 weeks

12. Do you regularly teach about global environmental issues?

____Yes ____No

13. If you don't regularly teach global environmental issues, did you find this unit offered enough information and materials to construct your lesson?

____Yes No, I also needed_____

14. Did you use other WRI materials with this unit?

____Yes ____No

If yes, which ones_____

15. Because new units of the *Teacher's Guide* are being developed, it is helpful for us to learn how the materials work. Did they engage your students? Prompt lively discussion? Help make what seemed abstract issues vivid? Please be specific with negative *or* positive comments.

_____

_____

_____

_____

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School or Organization_____

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May we call you to discuss your suggestions?

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